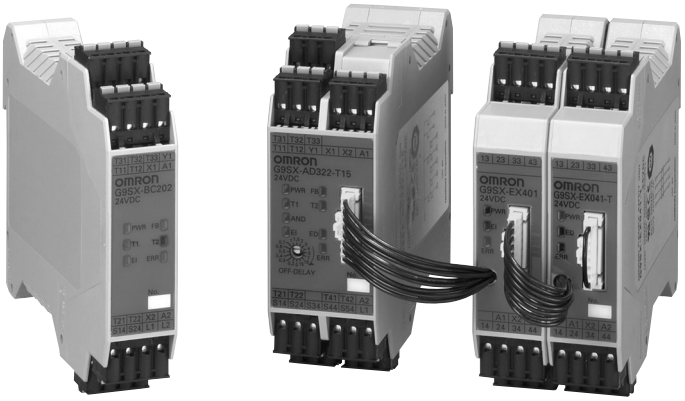
SAFETY, TECHNOLOGY & INNOVATION

OMRON

G9SX

USER'S GUIDE

G9SX	Flexible Safety Unit
G9SX-NS	Non-Contact Door Switch Controller
G9SX-GS	Safety Guard Switching Unit



Cat.No. Z255-E1-01

Introduction

This User's Guide describes the usage of the G9SX Series-Flexible Safety Units mainly through application examples.

Humans make mistakes and machines fail.
Therefore it is necessary to design machines and equipment based on the assumption that humans will make mistakes and machines will fail.
Thus, a circuit configuration is required to ensure safety, even when an onsite operator makes a mistake in machine operation or when a part of the machine fails. Flexible Safety Units, which enable various safety circuit patterns to be configured only by simple wiring, provide the core components of such safety circuits.

Use the OMRON Flexible Safety Units in your machine and equipment to improve the safety designs and onsite worker safety measures.

Outline of this User's Guide

Section 1	**Application Examples**	**Introduces applications that can be configured with the G9SX.**
Section 2	**Functions of G9SX**	**Describes the functions of each unit of G9SX Series.**
Section 3	**Wiring and Setup**	**Describes the wiring and settings required for use.**
Section 4	**Ratings and Specifications**	**Provides specifications, dimensions and terminal arrangements.**
Appendix		**Describes troubleshooting, accessories, and related products.**

Ordering Information

■ List of Models

Advanced Unit

Safety outputs (solid state) (See note 3.)		Auxiliary outputs (solid state) (See note 4.)	Logical AND connection		No. of input channels	Max. OFF-delay time (See note 1.)	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed (See note 2.)		Inputs	Outputs					
3 (Semiconductor)	2 (Semiconductor)	2 (Semiconductor)	1 (Semiconductor)	1 (Semiconductor)	1 or 2 channels	15 s	24 VDC	Screw terminals	G9SX-AD322-T15-RT
								Spring-cage terminals	G9SX-AD322-T15-RC
						150 s		Screw terminals	G9SX-AD322-T150-RT
								Spring-cage terminals	G9SX-AD322-T150-RC
2 (Semiconductor)			2 (Semiconductor)	2 (Semiconductor)		15 s		Screw terminals	G9SX-ADA222-T15-RT
								Spring-cage terminals	G9SX-ADA222-T15-RC
						150 s		Screw terminals	G9SX-ADA222-T150-RT
								Spring-cage terminals	G9SX-ADA222-T150-RC

Note: 1. The OFF-delay time can be set in 16 steps as follows:
T15: 0/0.2/0.3/0.4/0.5/0.6/0.7/1/1.5/2/3/4/5/7/10/15 s
T150: 0/10/20/30/40/50/60/70/80/90/100/110/120/130/140/150 s
2. The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
3. P channel MOS FET transistor output
4. PNP transistor output

Basic Unit

Safety outputs (solid state) (See note 1.)		Auxiliary outputs (solid state) (See note 2.)	Logical AND connection		No. of input channels	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed		Inputs	Outputs				
2 (Semiconductor)	---	2 (Semiconductor)	0	2	1 or 2 channels	24 VDC	Screw terminals	G9SX-BC202-RT
							Spring-cage terminals	G9SX-BC202-RC

Note: 1. P channel MOS FET transistor output
2. PNP transistor output

Non-Contact Door Switch Controller (Controllers for D40A)

Safety outputs (See note.1)		Auxiliary outputs (See note 3.)	Logical AND connection input	Logical AND connection output	Max. OFF-delay time (See note 4.)	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed (See note 2.)							
2 (Semiconductor)	0	2 (Semiconductor)	1	1	---	24 VDC	Screw terminals	G9SX-NS202-RT
							Spring-cage terminals	G9SX-NS202-RC
	2 (Semiconductor)				3.0 s		Screw terminals	G9SX-NSA222-T03-RT
							Spring-cage terminals	G9SX-NSA222-T03-RC

Note: 1. P channel MOS FET transistor output
2. The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
3. PNP transistor output
4. The OFF-delay time can be set in 16 steps as follows:
0/0.2/0.3/0.4/0.5/0.6/0.7/0.8/0.9/1.0/1.2/1.4/1.8/2.0/2.5/3.0 s

Safety Guard Switching Unit

Safety outputs (See note 3.)		Auxiliary outputs (See note 4.)	Logical AND connection		Max. OFF-delay time (See note 1.)	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed (See note 2.)		Inputs	Outputs				
2 (semiconductor)	2 (semiconductor)	6 (semiconductor)	1 (semiconductor)	1 (semiconductor)	15 s	24 VDC	Screw terminals	G9SX-GS226-T15-RT
							Spring-cage terminals	G9SX-GS226-T15-RC

Note: 1. The OFF-delay time can be set in 16 steps as follows:
T15: 0/0.2/0.3/0.4/0.5/0.6/0.7/1/1.5/2/3/4/5/7/10/15 s
2. The OFF-delayed output becomes an instantaneous output by setting the OFF-delay time to 0 s.
3. P channel MOS FET transistor output
4. PNP transistor output (except for the external indicator outputs, which are P channel MOS FET transistor outputs)

Expansion Unit

Safety outputs		Auxiliary outputs (See note 1.)	OFF-delay time	Rated voltage	Terminal block type	Model
Instantaneous	OFF-delayed					
4 PST-NO (contact)	---	1 (semiconductor)	---	24 VDC	Screw terminals	G9SX-EX401-RT
					Spring-cage terminals	G9SX-EX401-RC
---	4 PST-NO (contact)		(See note 2.)		Screw terminals	G9SX-EX041-T-RT
					Spring-cage terminals	G9SX-EX041-T-RC

Note: 1. PNP transistor output
2. The OFF-delay time is synchronized to the OFF-delay time setting in the connected Unit (G9SX-AD-□, G9SX-ADA-□, G9SX-NSA□ and G9SX-GS-□).

Model Number Structure

■ Model Number Legend

G9SX - □□□□□□ - □□□ - □□

1 2 3 4 5 6

1. Functions

AD/ADA :Advanced Unit
BC :Basic Unit
GS :Safety Guard Switching Unit
NS/NSA :D40A Controller
EX :Expansion Unit

2. Output Configuration (Instantaneous Safety Outputs)

0 : None
2 : 2 outputs
3 : 3 outputs
4 : 4 outputs

3. Output Configuration (OFF-delayed Safety Outputs)

0 : None
2 : 2 outputs
4 : 4 outputs

4. Output Configuration (Auxiliary Outputs)

1 : 1 output
2 : 2 outputs
6 : 6 outputs

5. Max. OFF-delay Time

Advanced Unit

T15 : 15 s
T150 : 150 s

Basic Unit

No indicator : No OFF delay

Safety Guard Switching Unit

T15 : 15 s

D40A Controller

T03 : 3 s

Expansion Unit

No indicator : No OFF delay
T : OFF delay

6. Terminal Block Type

RT : Screw terminals
RC : Spring-cage terminals

CONTENTS

Section 1	Application Examples	7

1. Partial control of machine	8
1-1 Parts Processing Machine	8
1-2 Machining Center	11
1-3 Semiconductor Manufacturing Equipment	15
1-4 Machine Tool	17

2. Using Non-contact Door Switch	20
2-1 Pick and Place Machine	20
2-2 Small Assembly System	22

3. Coordinated operation of worker and machine	25
3-1 Manufacturing Automotive Parts Using Semi-automatic Processing	25

4. Safety Measures for limited operations	28
4-1 Manufacturing Flat-panel Displays (Maintenance)	28
4-2 Machining Center (Enabling Switch)	31
4-3 LCD Manufacturing (Guard Lock Control)	34

Section 2	Functions of G9SX	37

1. Function list of G9SX-series	38

2. Functions of each Unit	39
2-1 Basic Unit	39
2-2 Advanced Unit	40
2-3 Non-Contact Door Switch Controller	42
2-4 Safety Guard Switching Unit	44
2-5 Expansion Unit	48

CONTENTS

Section 3	Wiring and Setup	51

1. I/O Terminals	52
1-1 Basic Unit	52
1-2 Advanced Unit	53
1-3 Non-contact Door Switch Controller	54
1-4 Safety Guard Switching Unit	55
1-5 Expansion Unit	56

2. Functions, Wiring and Settings	57
2-1 Logical AND Connection	57
2-2 Response Time and Operation Time	60
2-3 Reset Mode	62
2-4 Cross Fault Detection	63
2-5 Connecting Safety Sensors and the G9SX	64
2-6 OFF-delay Time	65
2-7 Non-contact Door Switch	66
2-8 Switching Mode	67
2-9 External Indicator Fault Diagnosis	68
2-10 Connecting Expansion Units	69
2-11 Confirming Settings	70

Section 4	Ratings and Specifications	71

1. Ratings	72
1-1 Advanced Unit/Basic Unit	72
1-2 Non-contact Door Switch Controller	73
1-3 Safety Guard Switching Unit	74
1-4 Expansion Unit	75

2. Characteristics	76
2-1 Advanced Unit/Basic Unit	76
2-2 Non-contact Door Switch Controller	77
2-3 Safety Guard Switching Unit	78
2-4 Expansion Unit	79

3. Dimensions and Terminal arrangements	80
3-1 Advanced Unit	80
3-2 Basic Unit	80
3-3 Non-contact Door Switch Controller	81
3-4 Safety Guard Switching Unit	81
3-5 Expansion Unit	82

Appendix	83
1. Troubleshooting	84
2. Logical AND Connections	91
3. Accessories and Related Products	93

Precautions	95

Section 1

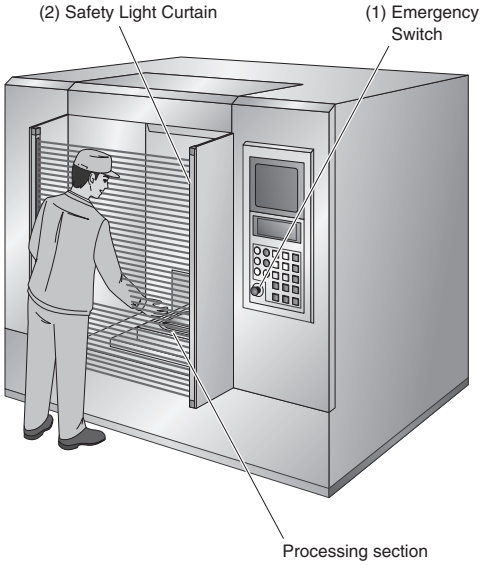
Application Examples

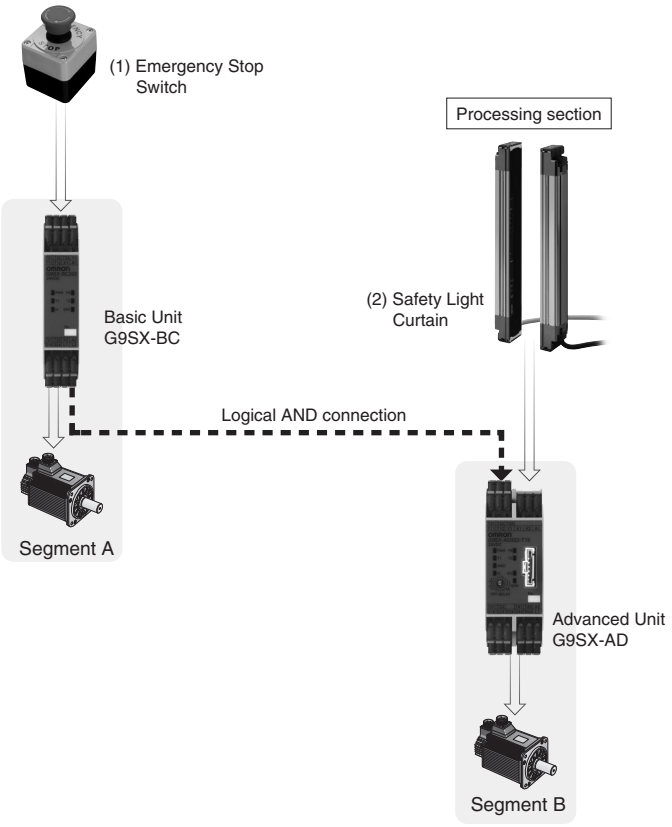
1. Partial control of machine	**8**
1-1 Parts Processing Machine	8
1-2 Machining Center	11
1-3 Semiconductor Manufacturing Equipment	15
1-4 Machine Tool	17
2. Using Non-contact Door Switch	**20**
2-1 Pick and Place Machine	20
2-2 Small Assembly System	22
3. Coordinated operation of worker and machine	**25**
3-1 Manufacturing Automotive Parts Using Semi-automatic Processing	25
4. Safety Measures for limited operations	**28**
4-1 Manufacturing Flat-panel Displays (Maintenance)	28
4-2 Machining Center (Enabling Switch)	31
4-3 LCD Manufacturing (Guard Lock Control)	34

1. Partial control of machine

1-1 Parts Processing Machine

The entire device stops when the Emergency Stop Switch is pressed.
Only the processing section stops when the Safety Light Curtain is interrupted.





Operation Example

(1) The Emergency Stop Switch is pressed.

(2) Safety Light Curtain is interrupted.

Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-AD	1	Safety Light Curtains	40

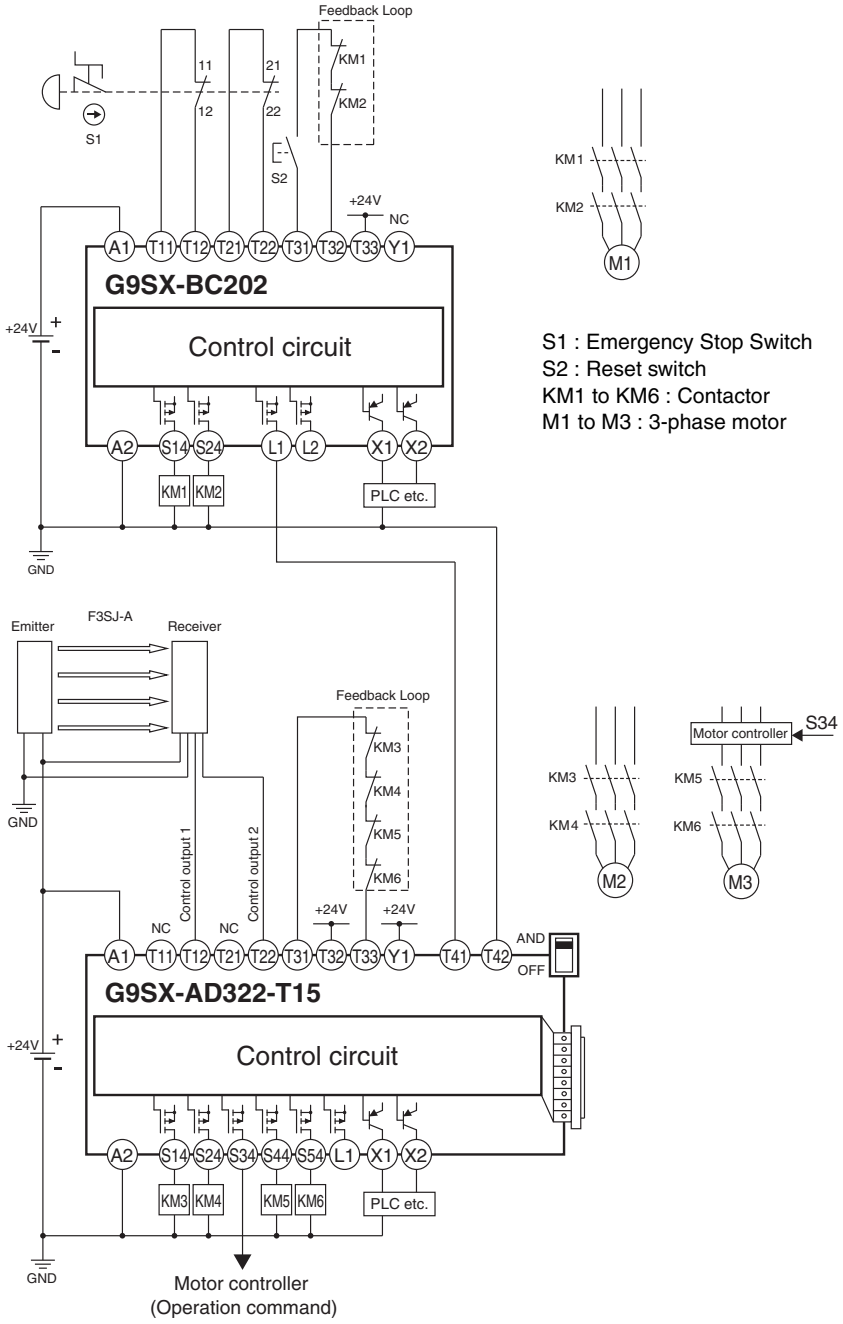
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-AD: Auto reset, Cross fault detection mode: OFF (Category 4 Wiring (with Safety Light Curtains)), Logical AND connections, OFF-delay time setting

Wiring Example



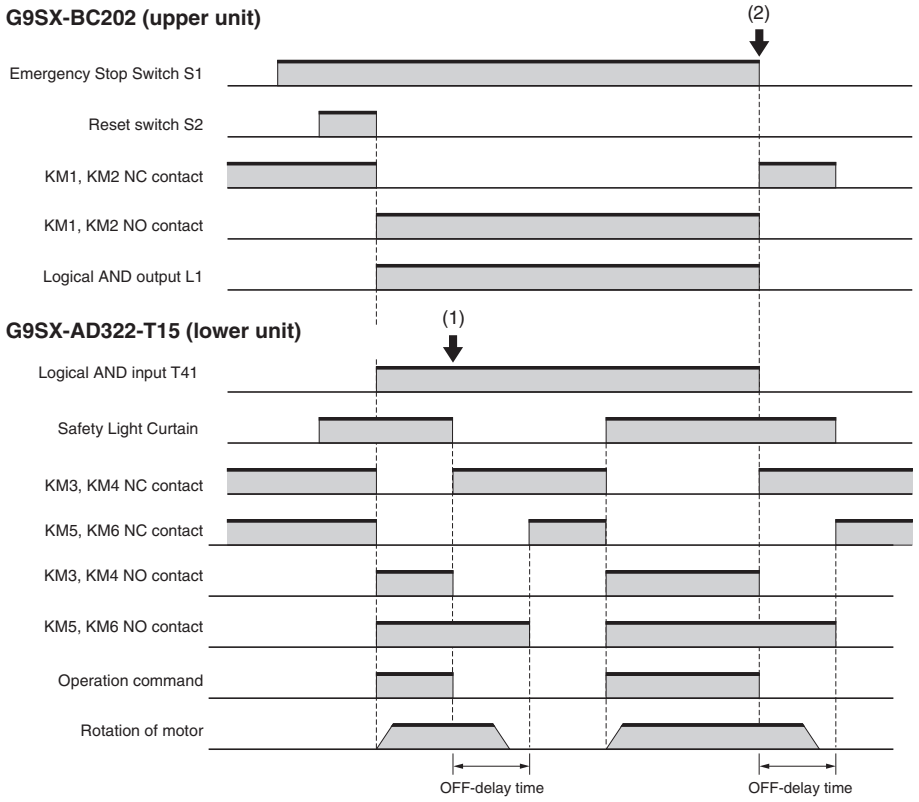
Note: 1. This example corresponds to category 4. (when using a Type-4 Safety Sensor).

2. For further information on settings and wiring, refer to the datasheet or instruction sheet for the Safety Sensor.

3. Use Safety Sensors with PNP control outputs.

1. Partial control of machine

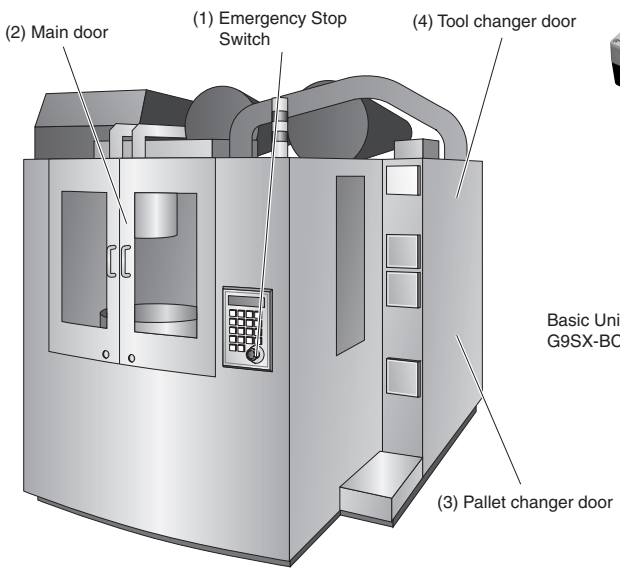
■ Timing chart

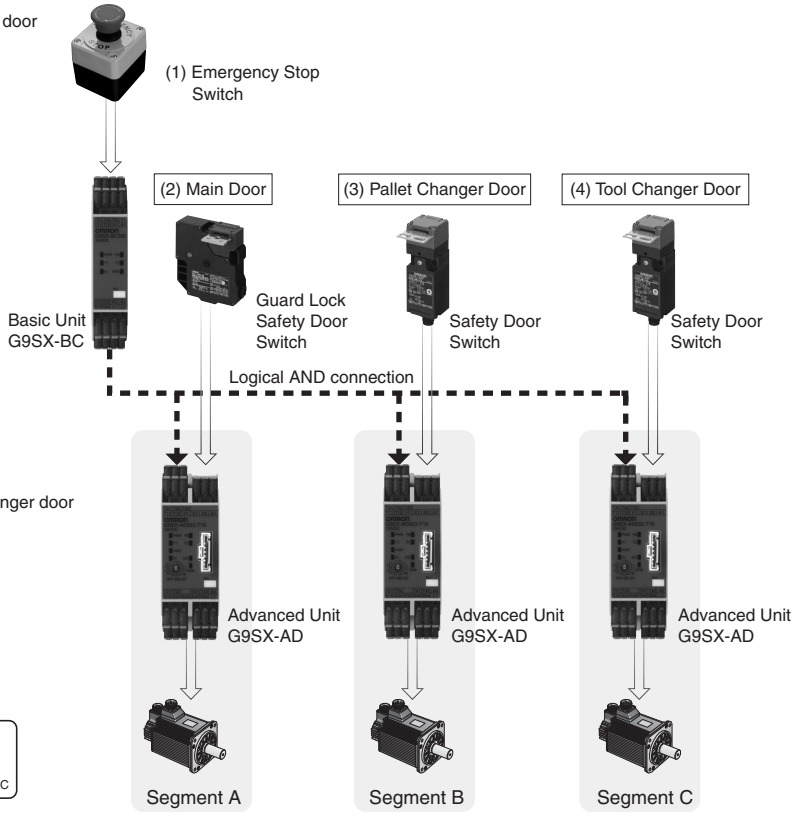


(1) Safety Light Curtain is interrupted: Only the lower Unit stops.
(2) Emergency stop button pressed: Both the upper and lower Unit stop.

1-2 Machining Center

When the Emergency Stop Switch is pressed, the entire machine will stop.
When a door is open, the corresponding part will not be activated.

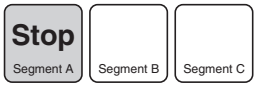




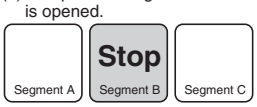
Operation Example

(1) The Emergency Stop Switch is pressed.

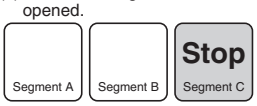
(2) The main door is opened.



(3) The pallet changer door is opened.



(4) The tool changer door is opened.



Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-AD	3	Guard Lock Safety Door Switch Safety Door Switches (Set of two)	40

1. Partial control of machine

■ Wiring Example

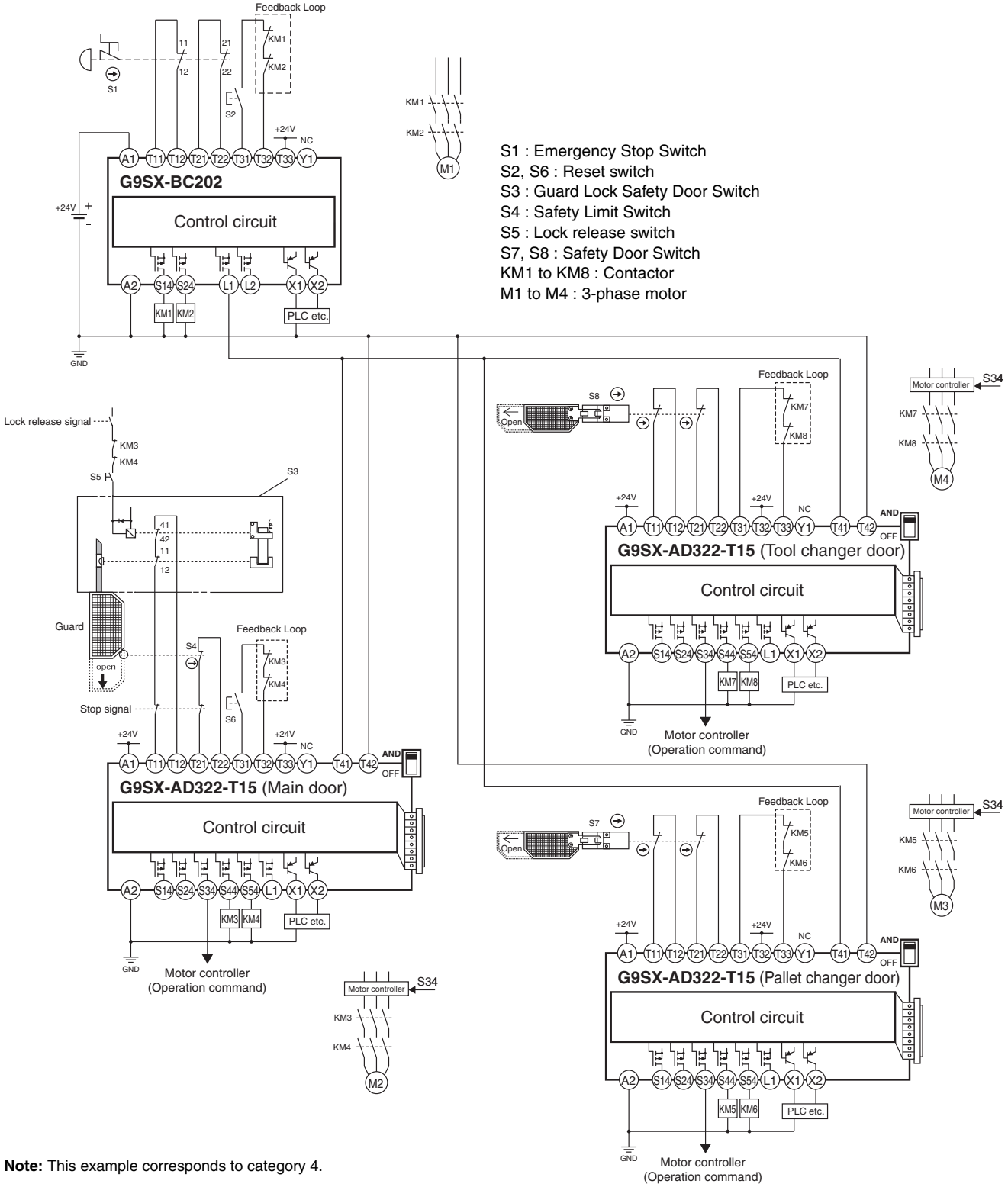
Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-AD (main door section): Manual reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections, OFF-delay time setting

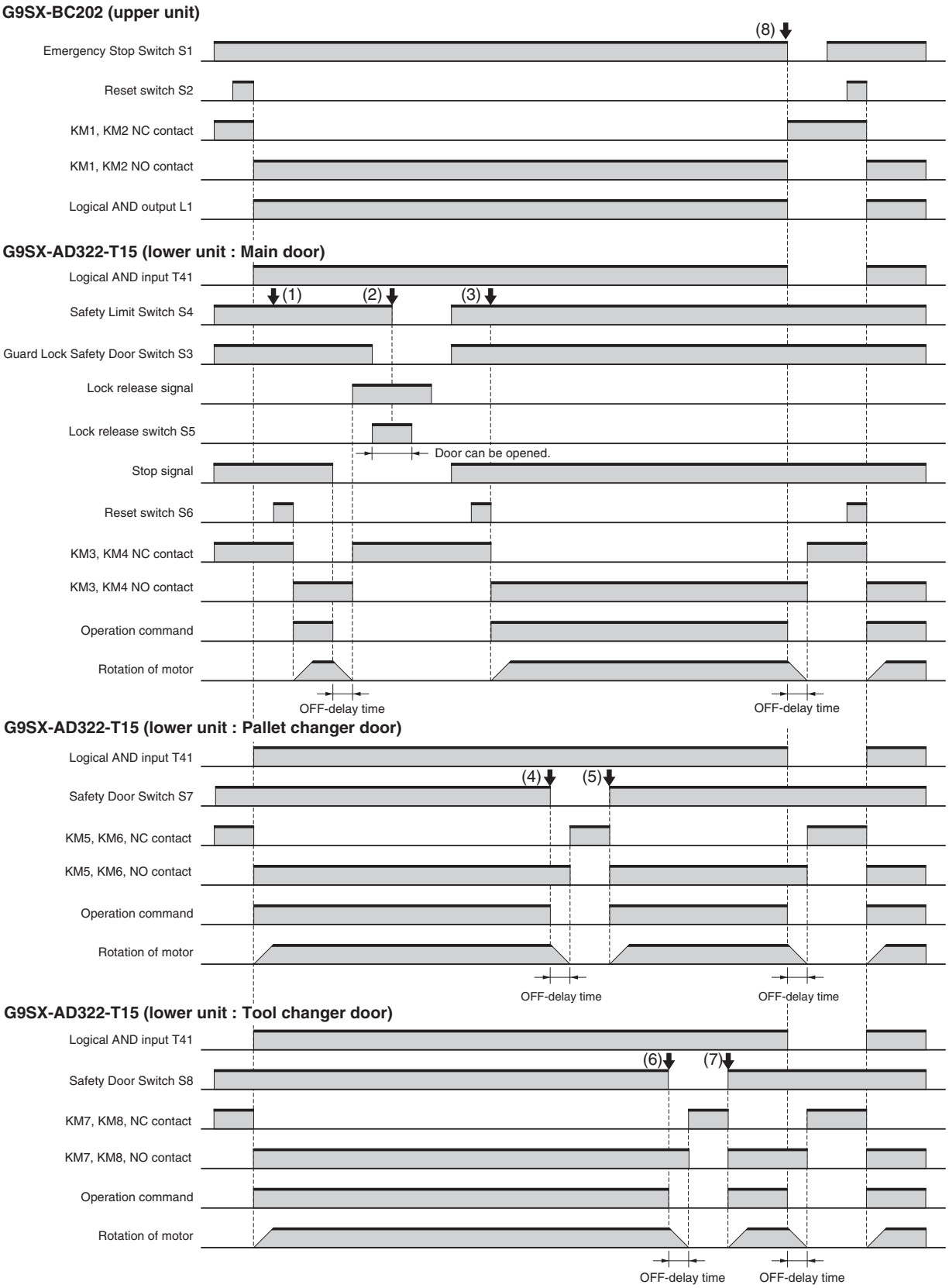
G9SX-AD (pallet changer, tool changer): Auto reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections, OFF-delay time setting

Wiring Example



Note: This example corresponds to category 4.

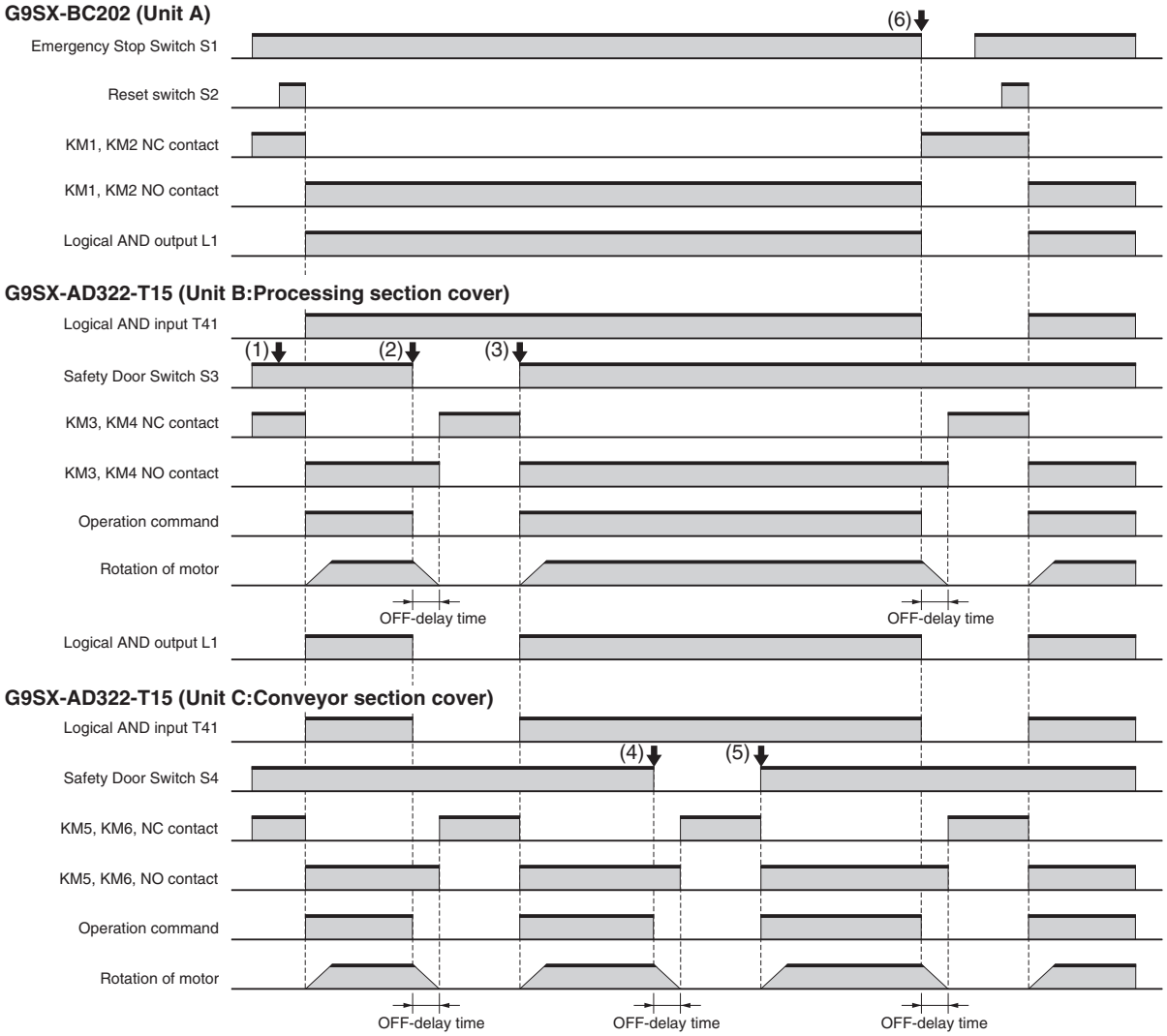
■ Timing chart



(1) Before operation is started.
(2) Main door is unlocked and opened, and then work is performed.
(3) Restart operation after the main door is closed.
(4) The pallet changer door opens and the pallet changer section stops.
(5) The pallet changer door is closed and the pallet changer is reset.
(6) The tool changer door opens and the tool changer section stops.
(7) The tool changer door is closed and the tool changer section is reset.
(8) If the Emergency Stop Switch is pressed, the upper unit and lower units will stop.

1. Partial control of machine

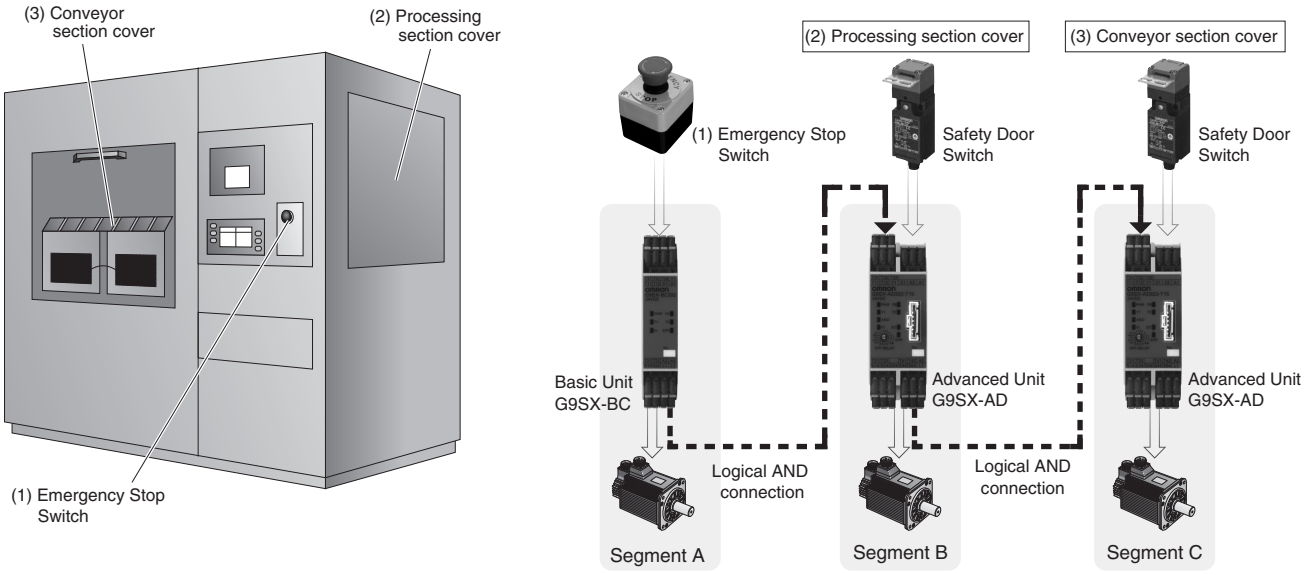
■ Timing chart



(1) Before operation is started.
(2) The processing section cover is opened, and the processing section and the conveyor section stops.
(3) The processing section cover is closed and the processing section and conveyor section restart.
(4) The conveyor section cover is opened and the conveyor section stops.
(5) The transport section cover is closed and the conveyor section restarts.
(6) If the Emergency Stop Switch is pressed, unit A, unit B, and unit C will stop.

1-3 Semiconductor Manufacturing Equipment

When the Emergency Stop Switch is pressed, all of the equipment stops.
When the processing section cover is opened, the processing section and conveyor section stop.
When the conveyor section cover is opened, only the conveyor section stops.

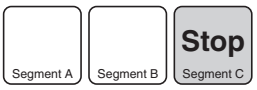


Operation Example

(1) The Emergency Stop Switch is pressed.

(2) The processing section cover is opened.

(3) The conveyor section cover is opened.



Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-AD	2	Safety Door Switches (Set of two)	40

1. Partial control of machine

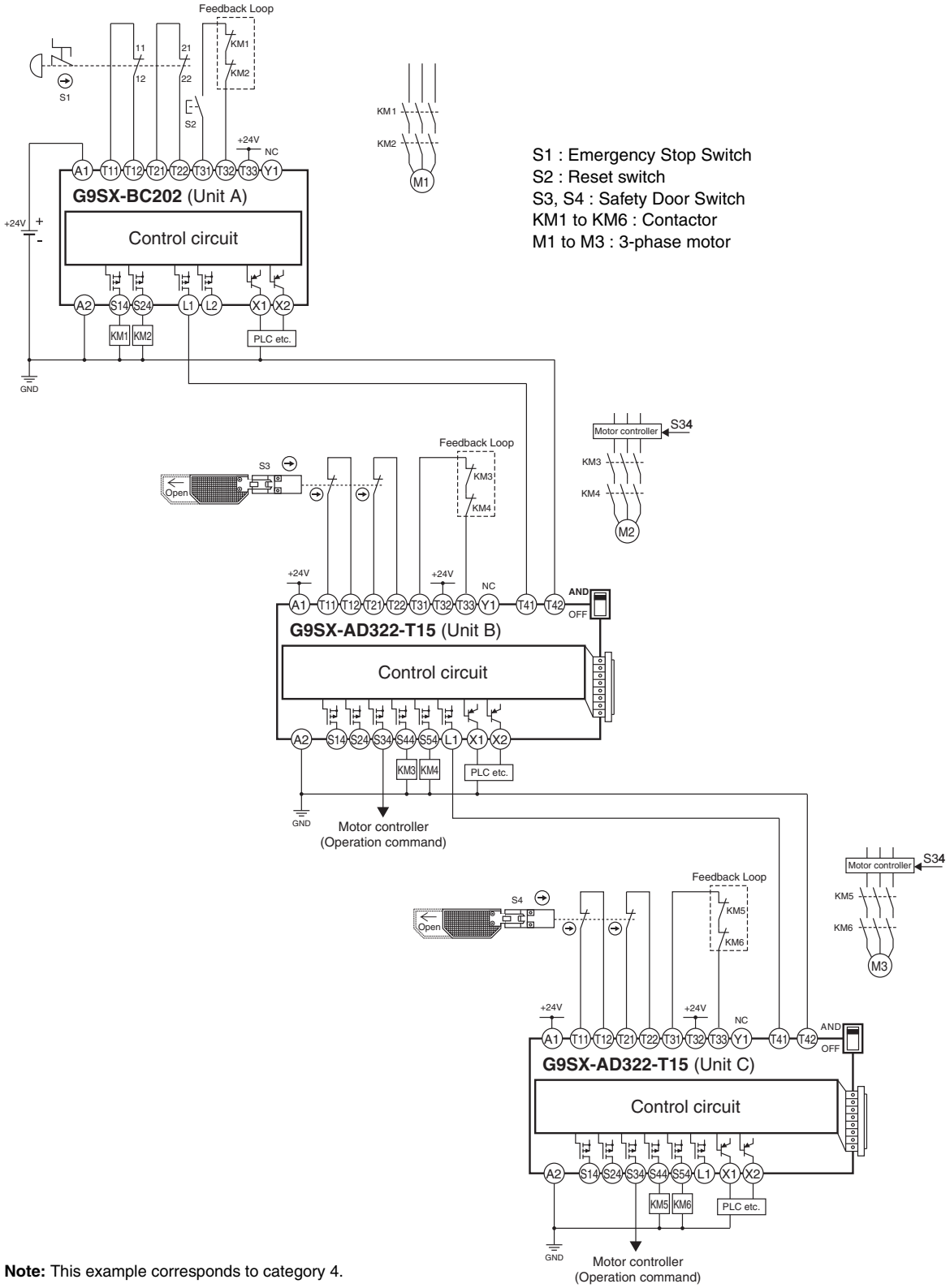
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-AD: Auto reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections, OFF-delay time setting

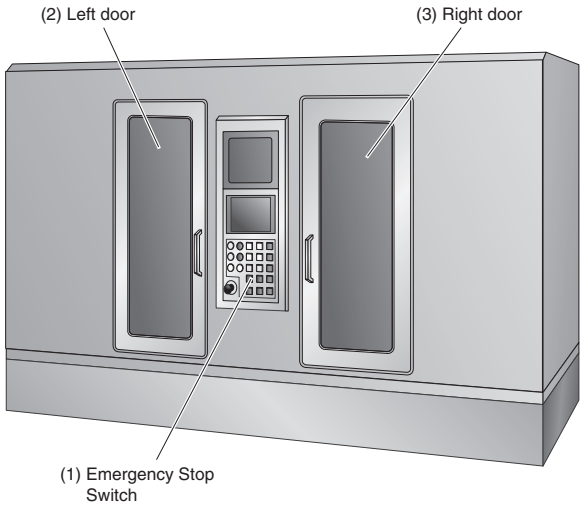
Wiring Example

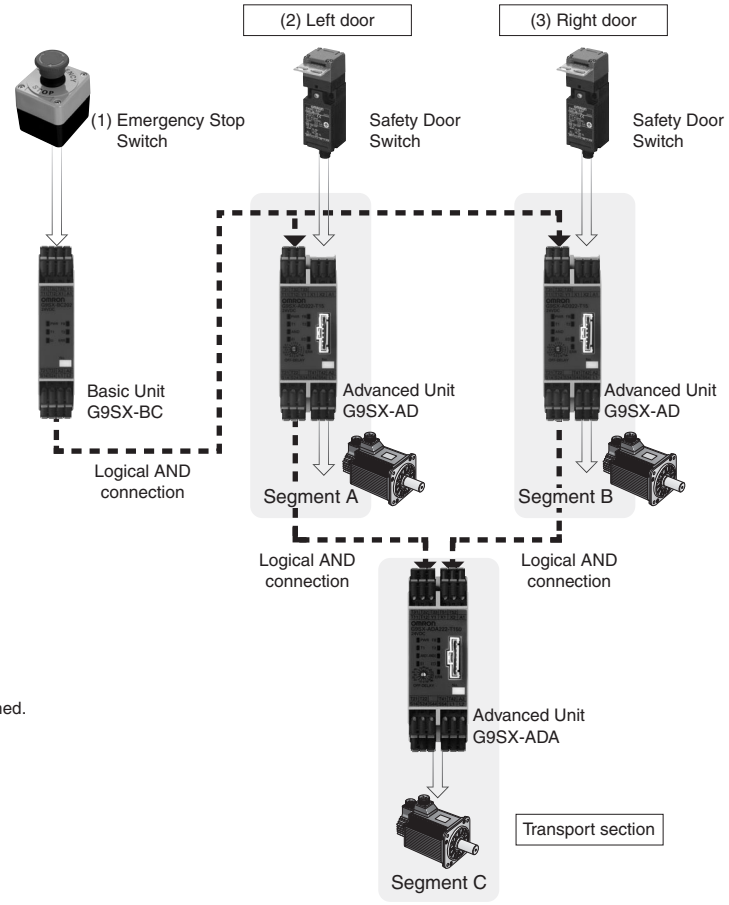


Note: This example corresponds to category 4.

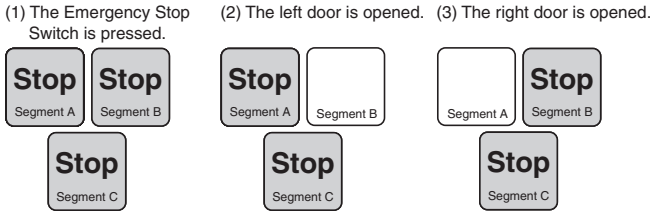
1-4 Machine Tool

When the Emergency Stop Switch is pressed, the entire machine will stop.
If the left door is opened, the left drive section and transport section will stop.
If the right door is opened, the right drive section and transport section will stop.





Operation Example



Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-AD	2	Safety Door Switches (Set of two)	40
G9SX-ADA	1	---	41

1. Partial control of machine

■ Wiring Example

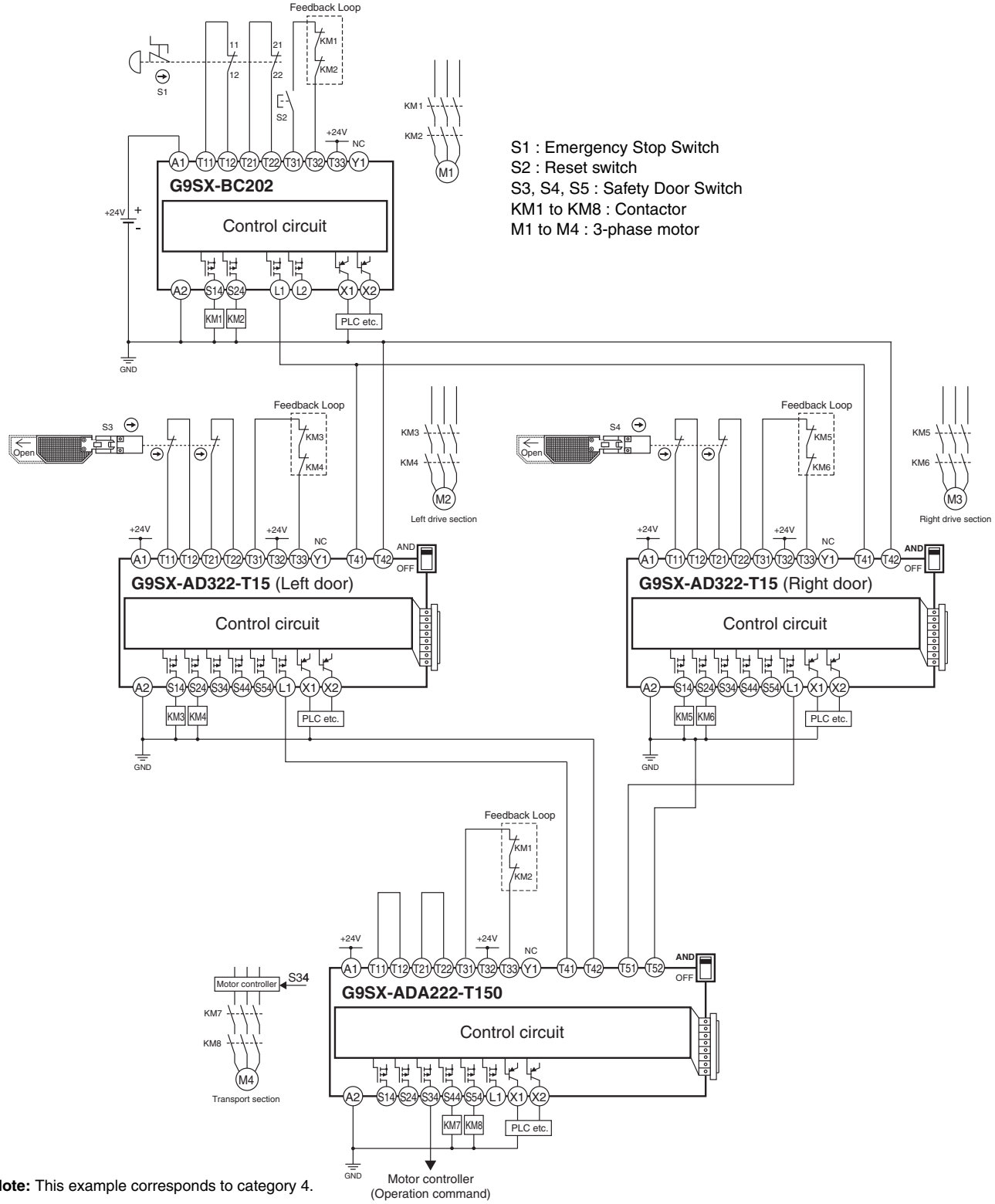
Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-AD: Auto reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections, No OFF-delay time setting

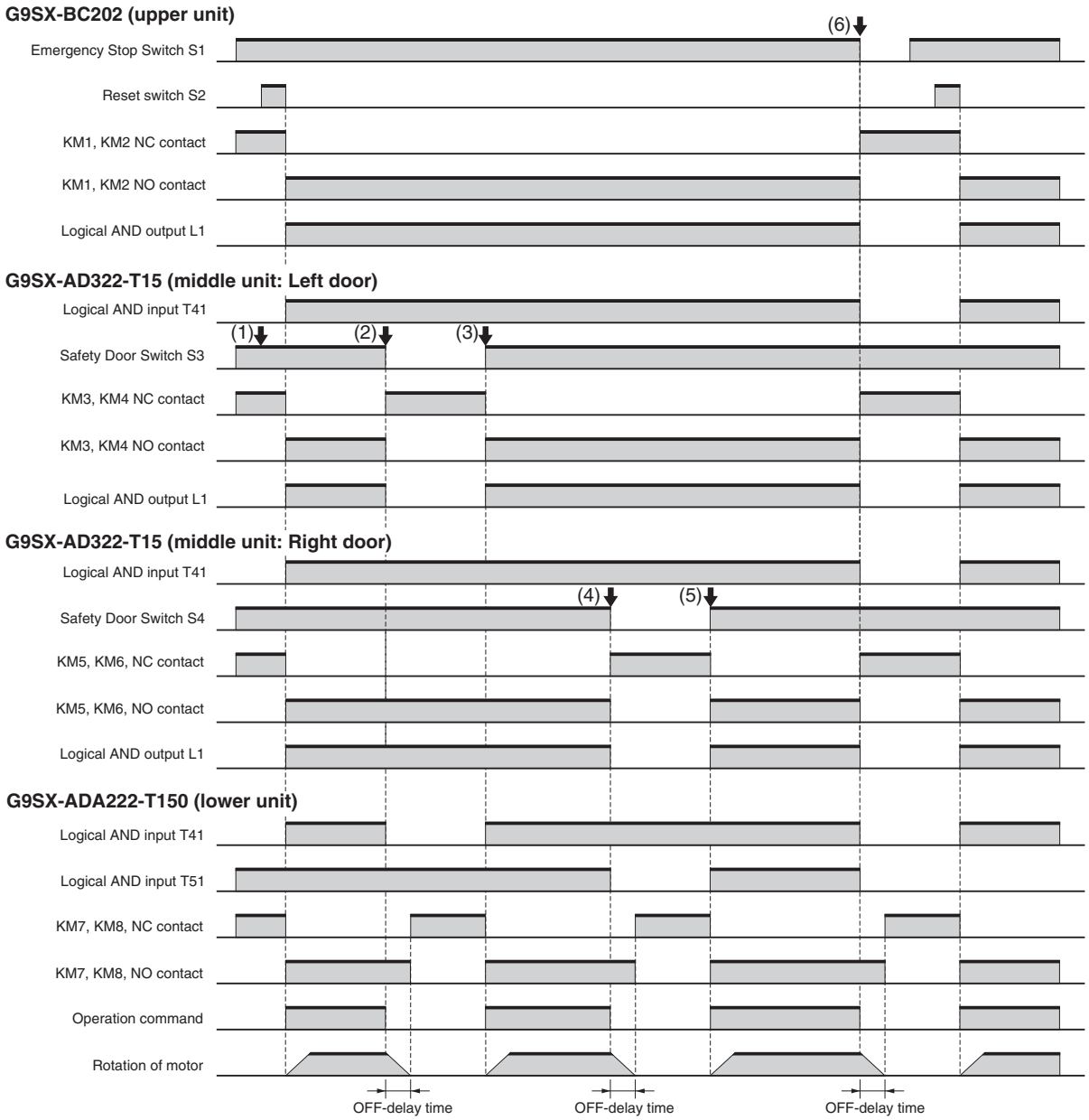
G9SX-ADA: Auto reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections, OFF-delay time setting

Wiring Example



Note: This example corresponds to category 4.

■ Timing chart

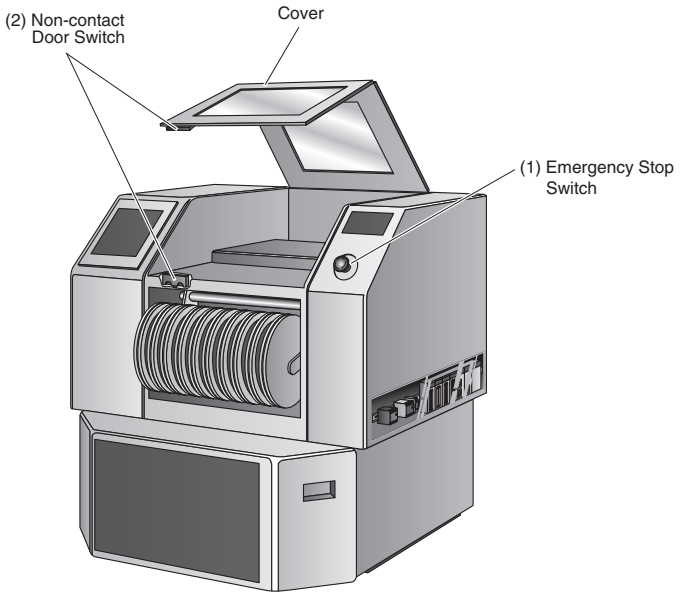


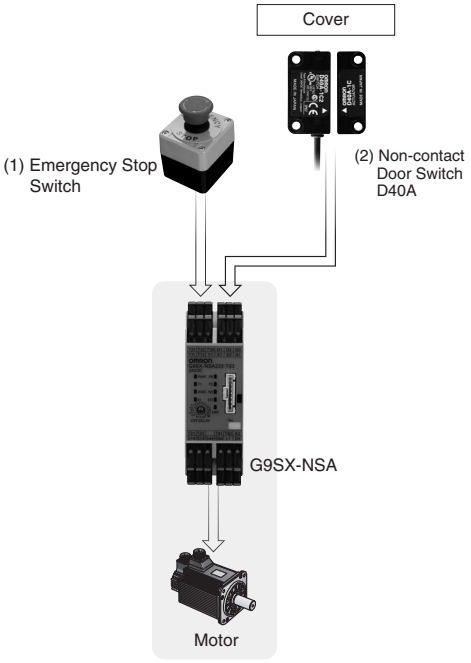
(1) Before operation is started.
(2) The left door is opened and the left drive section and transport section stop.
(3) The left door is closed and the left drive section and transport section restart.
(4) The right door is opened and the right drive section and transport section stop.
(5) The right door is closed and the right drive section and transport section restart.
(6) If the Emergency Stop Switch is pressed, the Upper Unit, Middle Unit, and Lower Unit will stop.

2. Using Non-contact Door Switch

2-1 Pick and Place Machine

If the Emergency Stop Switch is pressed, the entire machine will stop.
If the cover is opened, the entire machine will stop.





Operation Example

(1) The Emergency Stop Switch is pressed.

Stop
Motor

(2) Cover is opened.

Stop
Motor

Required Units

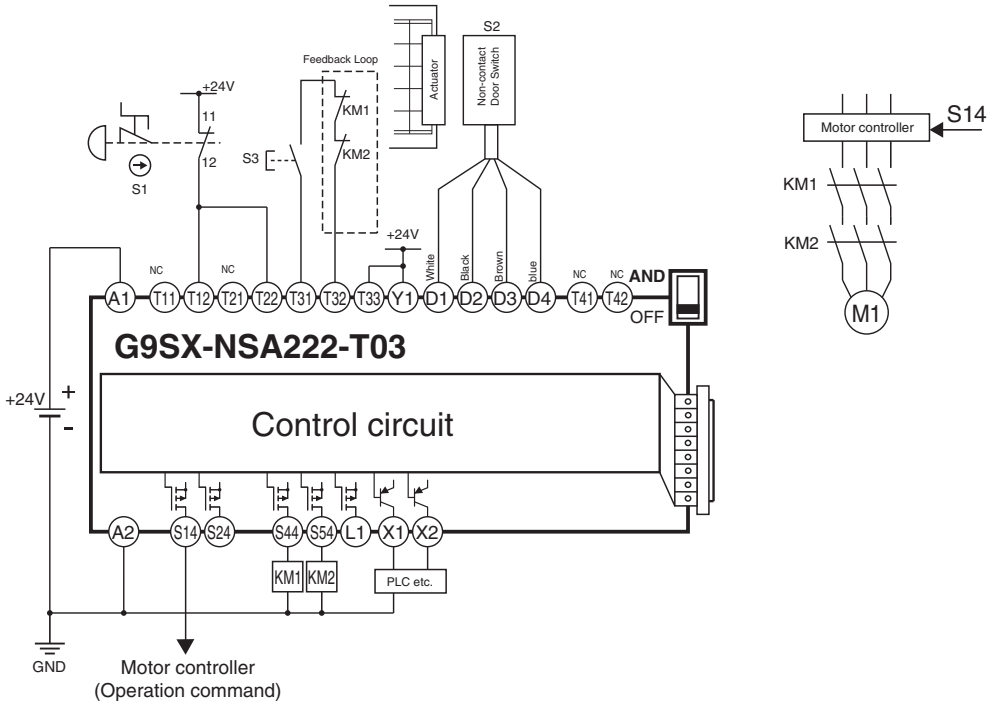
Unit	Qty.	Safety input to be applied	Page
G9SX-NSA	1	Emergency Stop Switch + Non-contact Door Switch D40A	43

■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-NSA: Manual reset, Cross fault detection mode: OFF (Category 2 Wiring), Logical AND connections: OFF, OFF-delay time setting

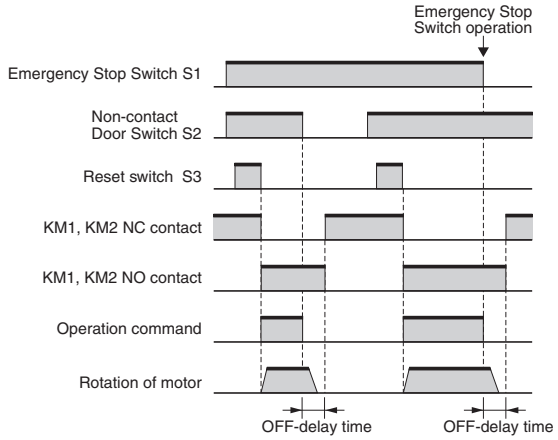
Wiring Example



S1 : Emergency Stop Switch
S2 : Non-contact Door Switch
S3 : Reset switch
KM1, KM2 : Contactor
M1 : 3-phase motor

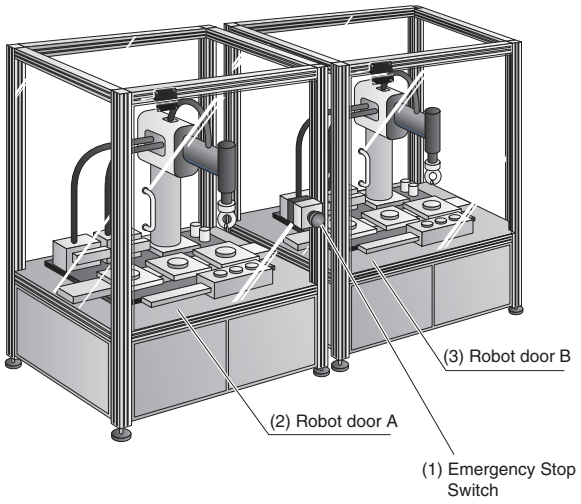
Note: This example corresponds to category 2.

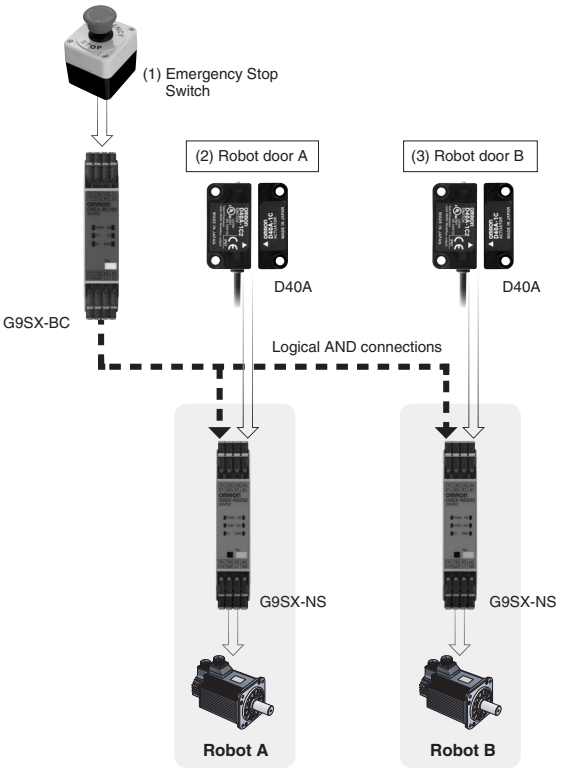
■ Timing chart



2-2 Small Assembly System

When the Emergency Stop Switch is pressed, both robots will stop.
When robot door A is opened, robot A will stop.
When robot door B is opened, robot B will stop.

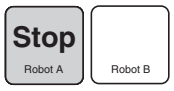




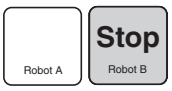
Operation Example

(1) The Emergency Stop Switch is pressed.

(2) Robot door A opened.



(3) Robot door B opened.



Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-NS	2	Non-contact Door Switches D40A (Set of two)	42

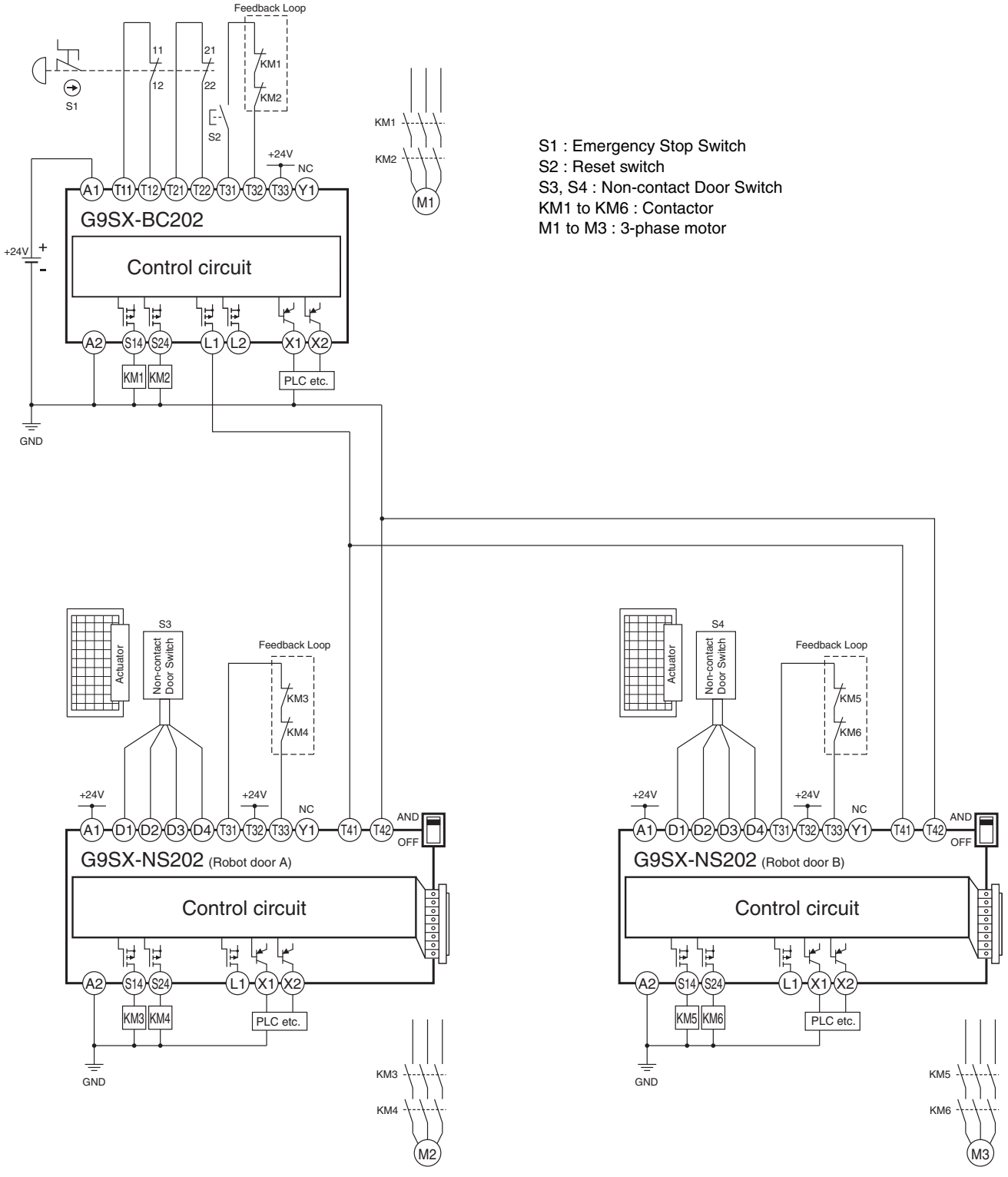
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-NS: Auto reset, Logical AND connections (Category 3 Wiring)

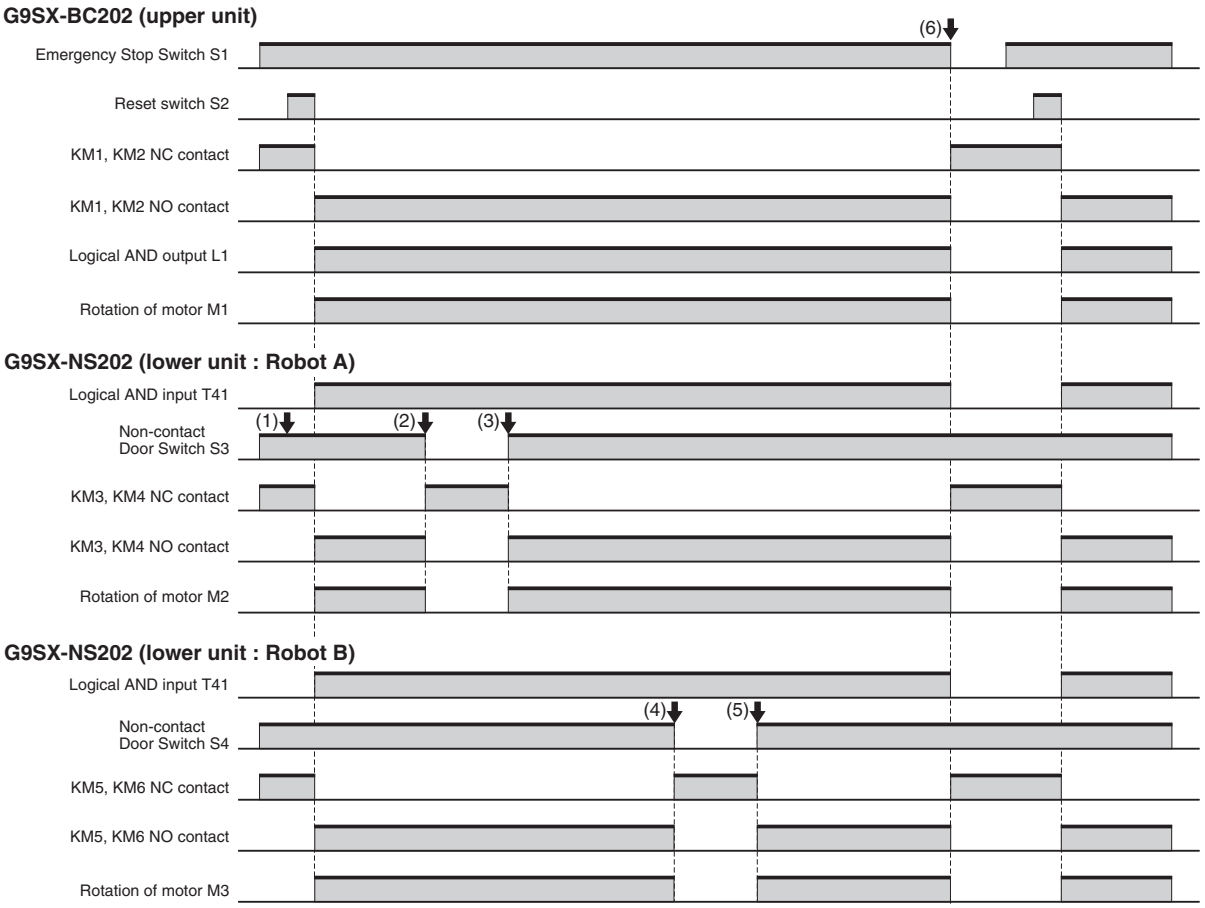
Wiring Example



Note: This example corresponds to category 3.

2. Using Non-contact Door Switch

■ Timing chart

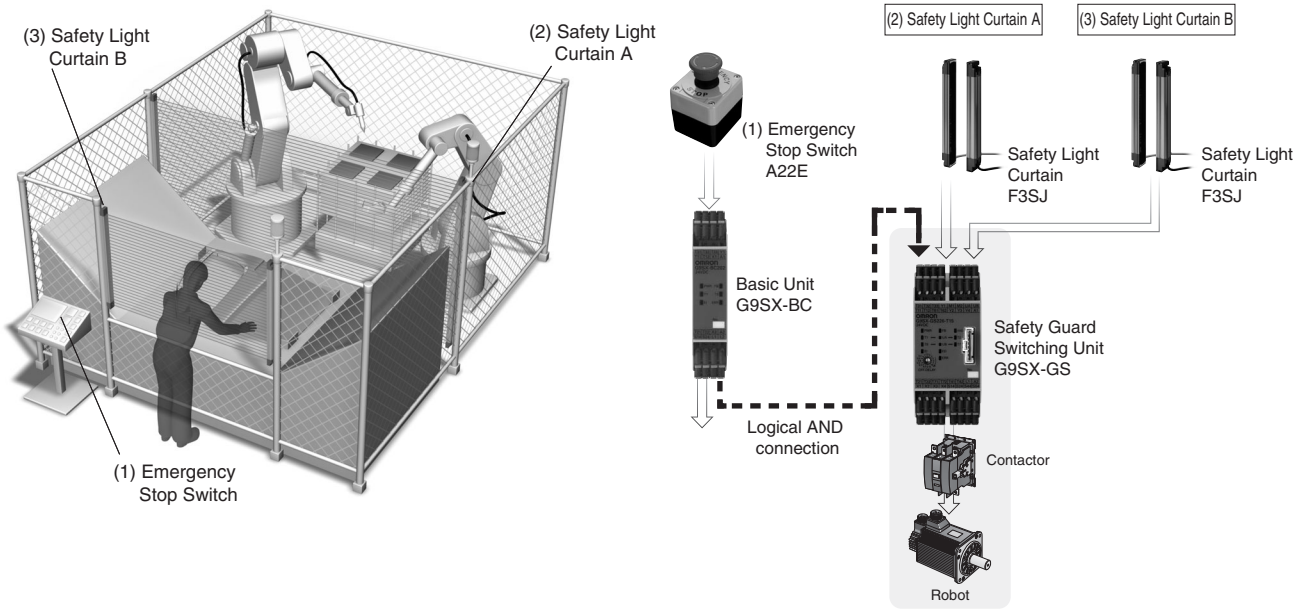


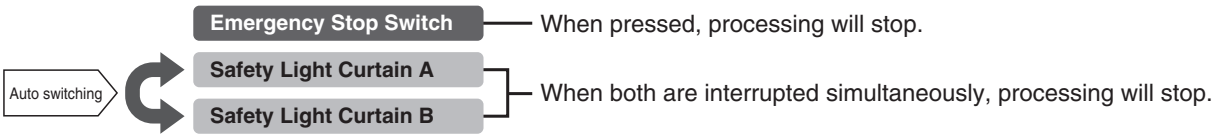
(1) Before operation is started.
(2) Robot door A is opened and robot A stops.
(3) Robot door A is closed and robot A restarts.
(4) Robot door B is opened and robot B stops.
(5) Robot door B is closed and robot B restarts.
(6) If the Emergency Stop Switch is pressed, the upper unit, lower unit A, and lower unit B will all stop.

3. Coordinated operation of worker and machine

3-1 Manufacturing Automotive Parts Using Semi-automatic Processing

Two pairs of Light Curtains are automatically enabled and disabled according to the operations of the operator and robot.




Emergency Stop Switch
When pressed, processing will stop.
Auto switching
Safety Light Curtain A
Safety Light Curtain B
When both are interrupted simultaneously, processing will stop.

Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-GS	1	Light Curtain + Light Curtain	44

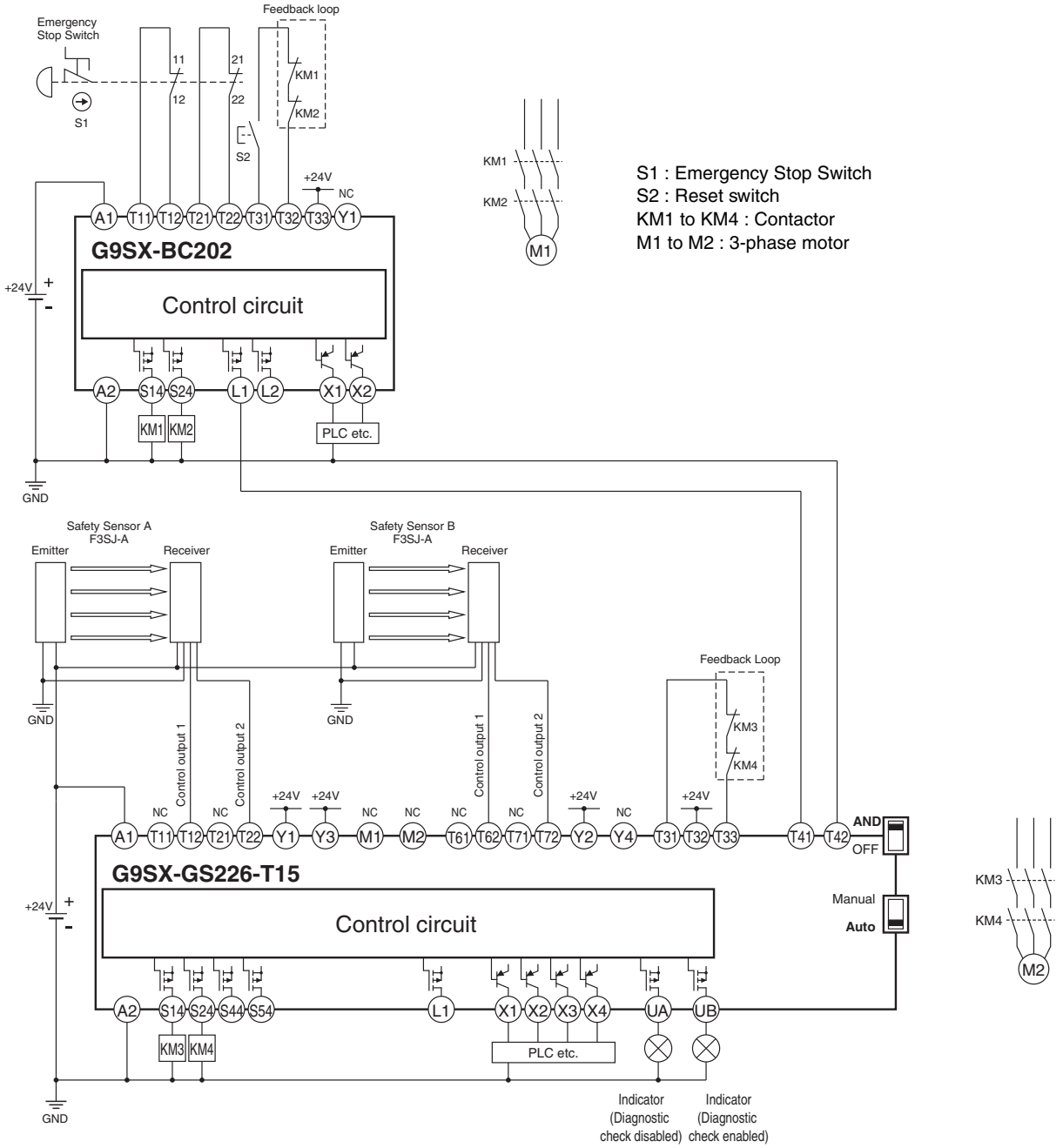
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

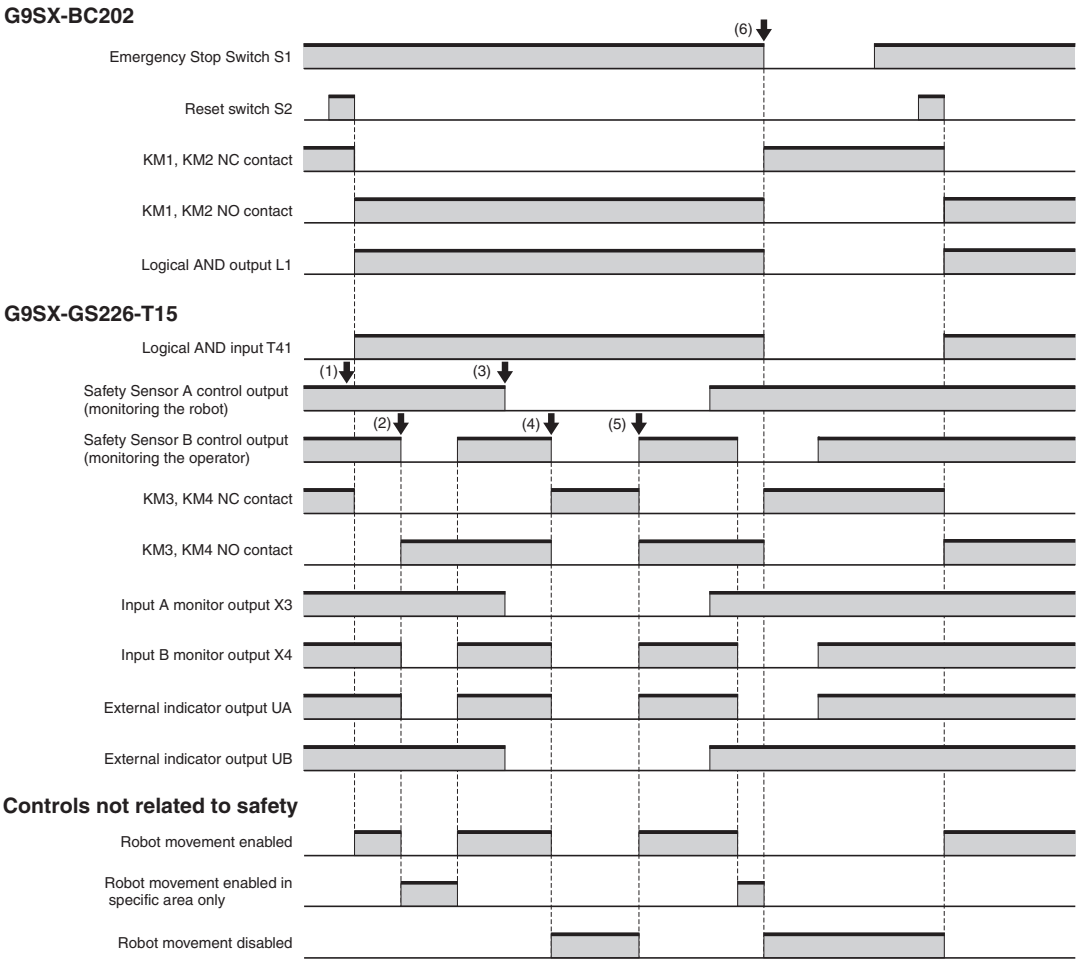
G9SX-GS: Auto reset, Cross fault detection mode: OFF (Category 4 Wiring (with Safety Light Curtains)),
Logical AND connections,
OFF-delay time setting
Switching mode: Auto
Diagnostic check of Indicator : Enabled (UB only)

Wiring Example



Note: This example corresponds to category 4.

■ Timing chart

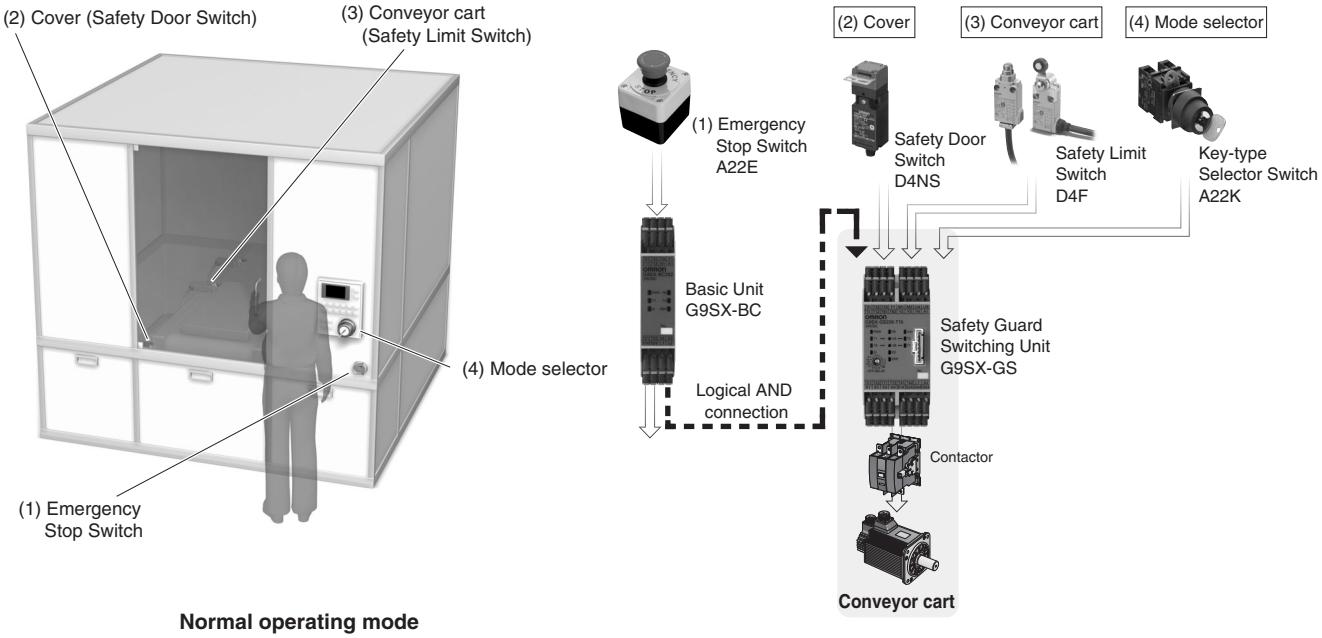


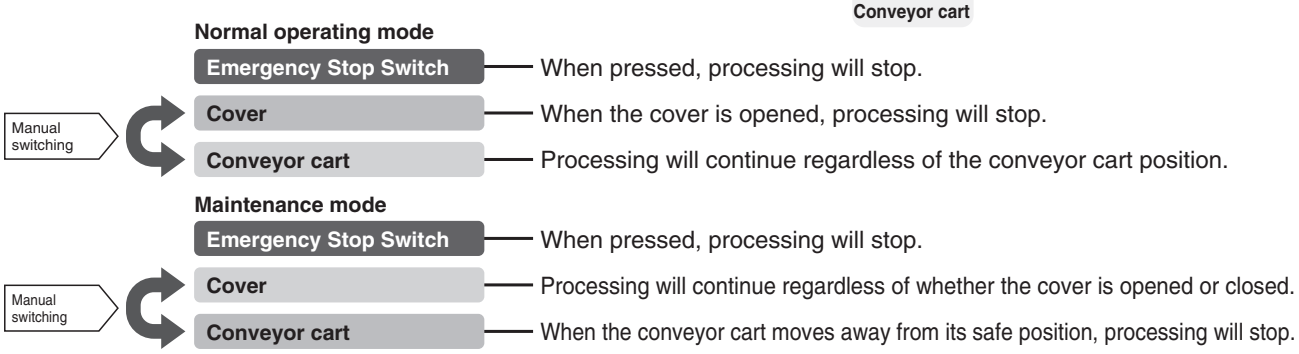
(1) Before operation is started.
(2) Operator inserts workpiece
(3) Robot processes workpiece
(4) Both operator and robot enter the coordinated area: Only the G9SX-GS stops.
(5) The G9SX-GS restarts.
(6) Emergency stop button pressed: All units stop.

4. Safety Measures for limited operations

4-1 Manufacturing Flat-panel Displays (Maintenance)

Switching between Normal Operating Mode and Maintenance Mode is performed manually. In Normal Operating Mode, the Safety Door Switch is enabled, and in Maintenance Mode the Safety Limit Switch is enabled.




Normal operating mode
Emergency Stop Switch
When pressed, processing will stop.
Manual switching
Cover
When the cover is opened, processing will stop.
Conveyor cart
Processing will continue regardless of the conveyor cart position.
Maintenance mode
Emergency Stop Switch
When pressed, processing will stop.
Manual switching
Cover
Processing will continue regardless of whether the cover is opened or closed.
Conveyor cart
When the conveyor cart moves away from its safe position, processing will stop.

Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-GS	1	Door Switch + Limit Switch	44

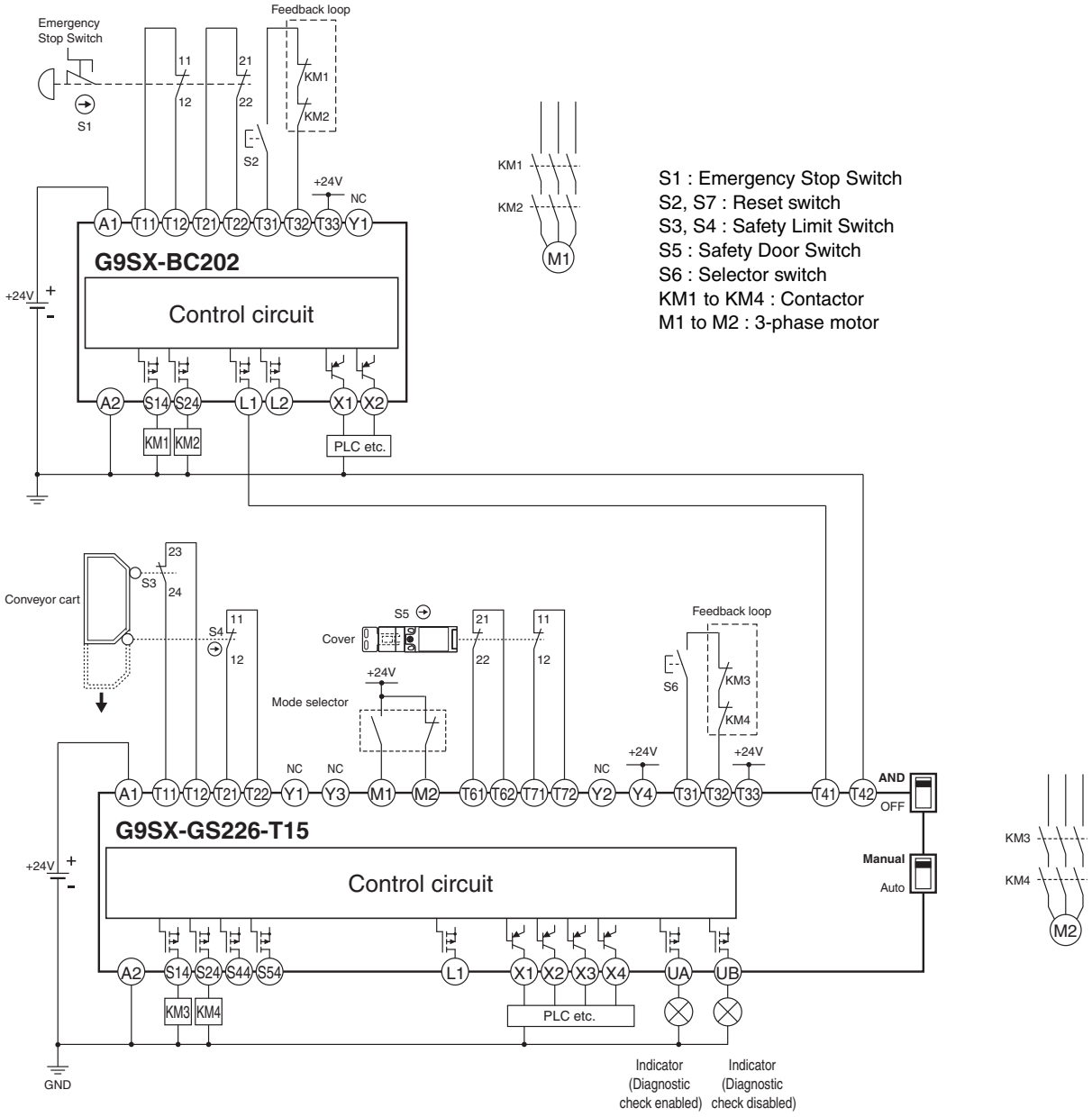
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-GS: Manual reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections,
OFF-delay time setting
Switching mode: Manual
Diagnostic check of Indicator: Enabled (UA only)

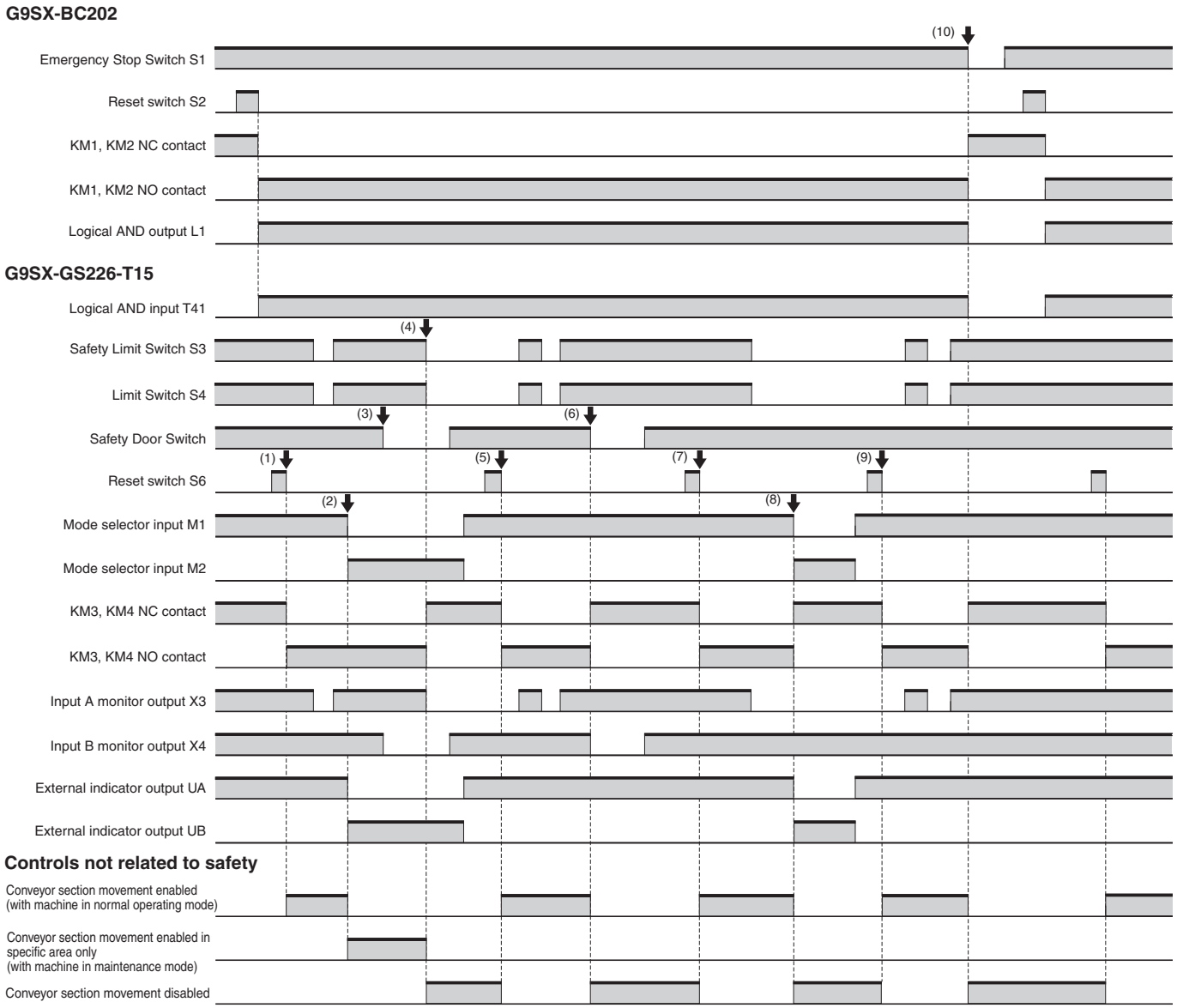
Wiring Example



Note: This example corresponds to category 4.

4. Safety Measures for limited operations

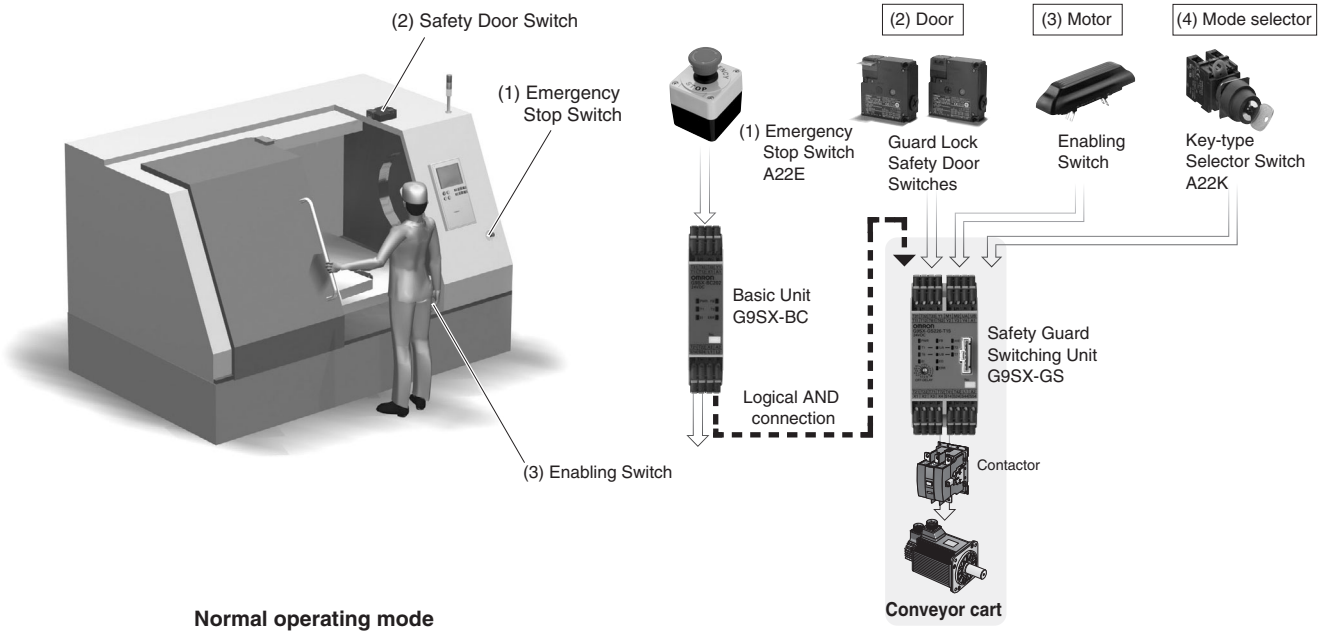
■ Timing chart



(1) Start the G9SX-GS in normal operating mode.
(2) Switch to maintenance mode.
(3) The operator opens the door and performs maintenance.
(4) When Safety Limit Switch S3 and Limit Switch S4 are turned OFF in maintenance mode, the G9SX-GS stops.
(5) After the door is closed and the operating mode is switched to normal operating mode, restart the G9SX-GS.
(6) When the door is opened during normal operating mode, the G9SX-GS stops.
(7) Close the door and restart the G9SX-GS.
(8) When the operating mode is switched to maintenance mode while Safety Limit Switch S3 and Limit Switch S4 are turned OFF, the G9SX-GS stops.
(9) Switch to normal operating mode, and when the door is closed, restart the G9SX-GS.
(10) Emergency stop button pressed: All units stop.

4-2 Machining Center (Enabling Switch)

Switching between Normal Operating Mode and Maintenance Mode is performed manually. In Normal Operating Mode, the Safety Door Switch is enabled, and in Maintenance Mode, the Safety Limit Switch is enabled.



Normal operating mode

	Emergency Stop Switch	When pressed, processing will stop.
Manual switching	**Door**	When the door is opened, processing will stop.
	Enabling Device	The enabling switch is disabled.

Maintenance mode

	Emergency Stop Switch	When pressed, processing will stop.
Manual switching	**Door**	Door Switch is disabled.
	Enabling Device	Processing will be possible only when the operator is gripping the enabling switch.

Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-GS	1	Door Switch + Enabling Switch	44

4. Safety Measures for limited operations

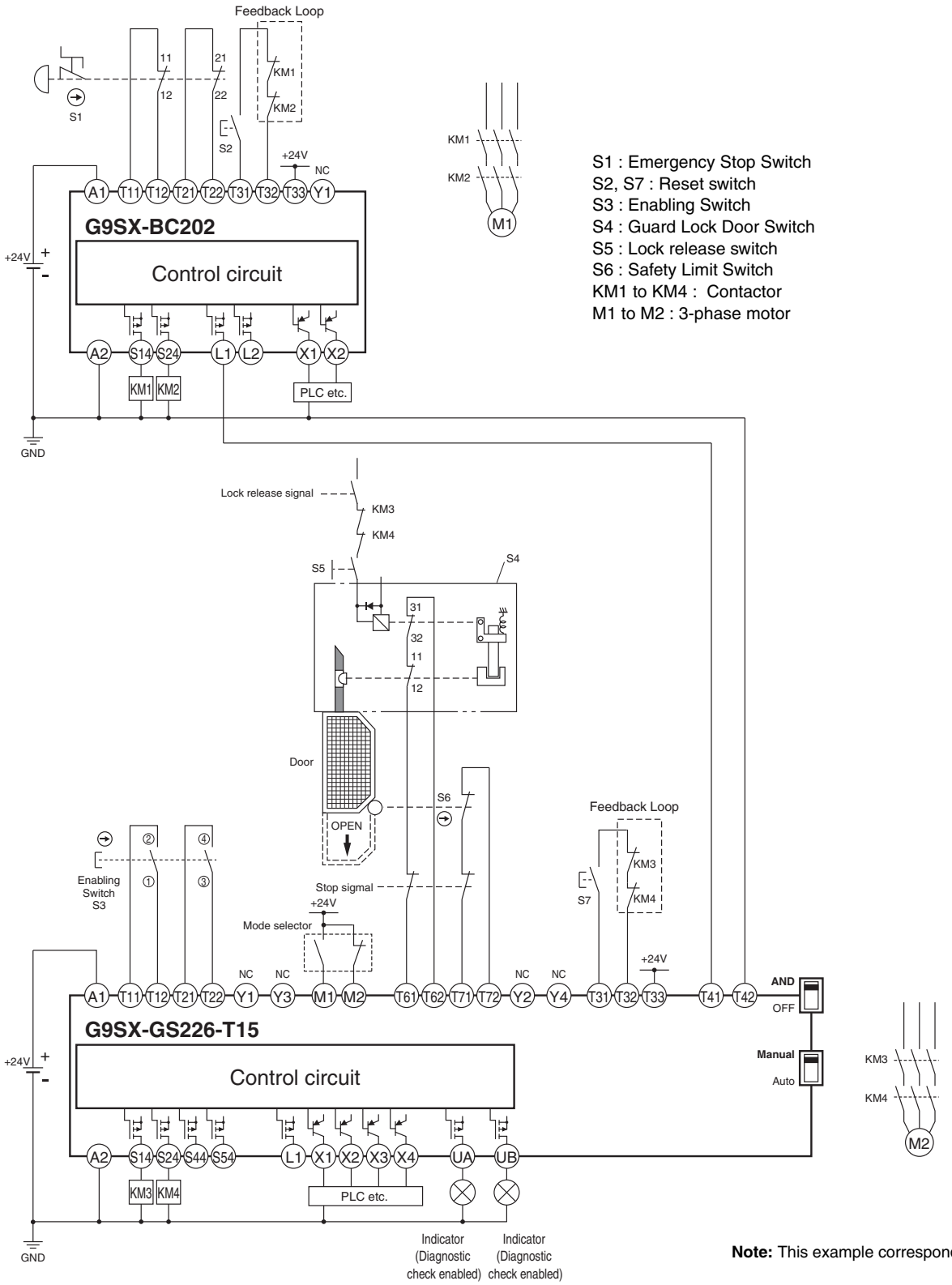
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

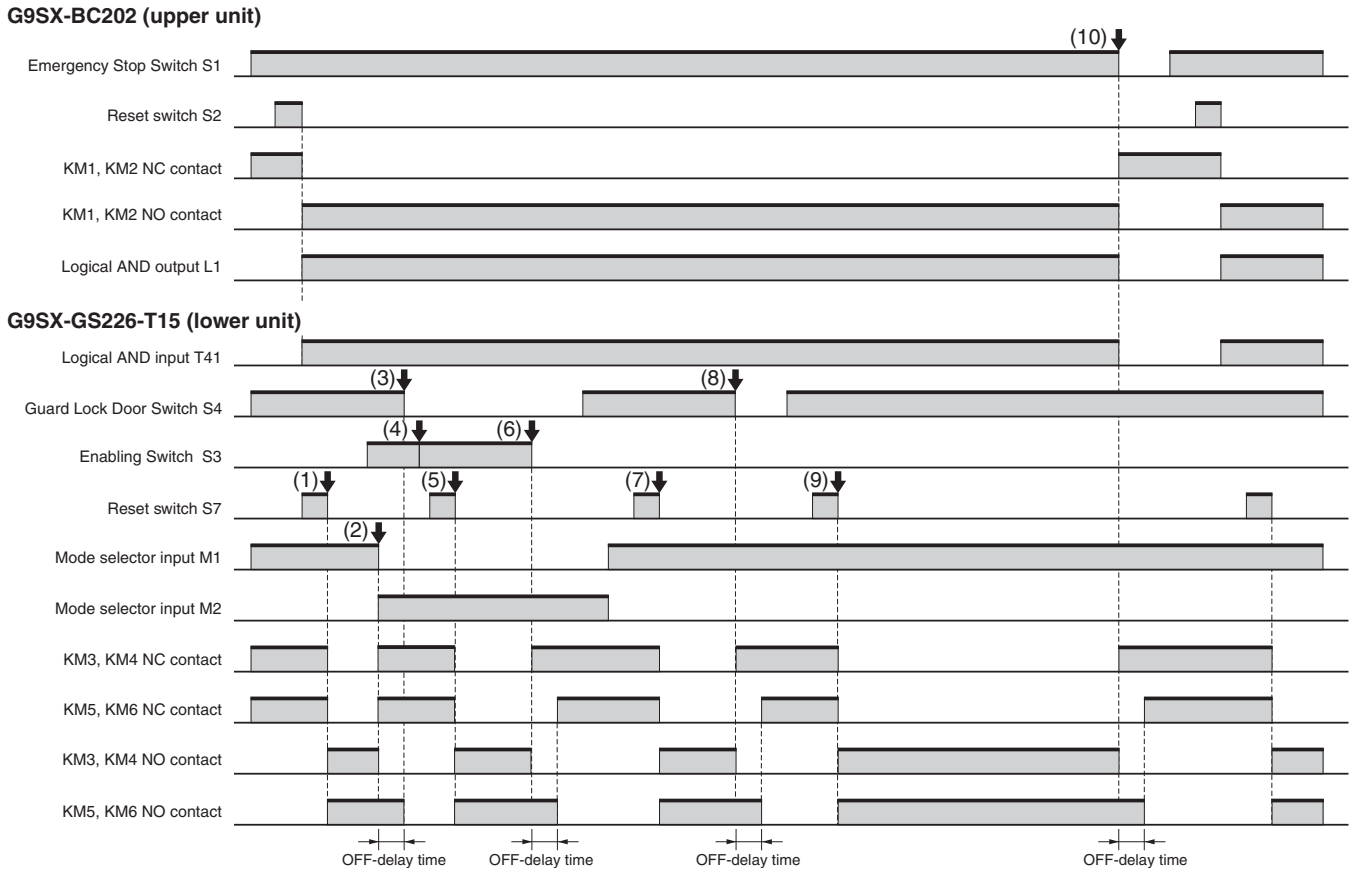
G9SX-GS: Manual reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections,
OFF-delay time setting
Switching mode: Manual
Diagnostic check of Indicator: Enabled

Wiring Example



Note: This example corresponds to category 4.

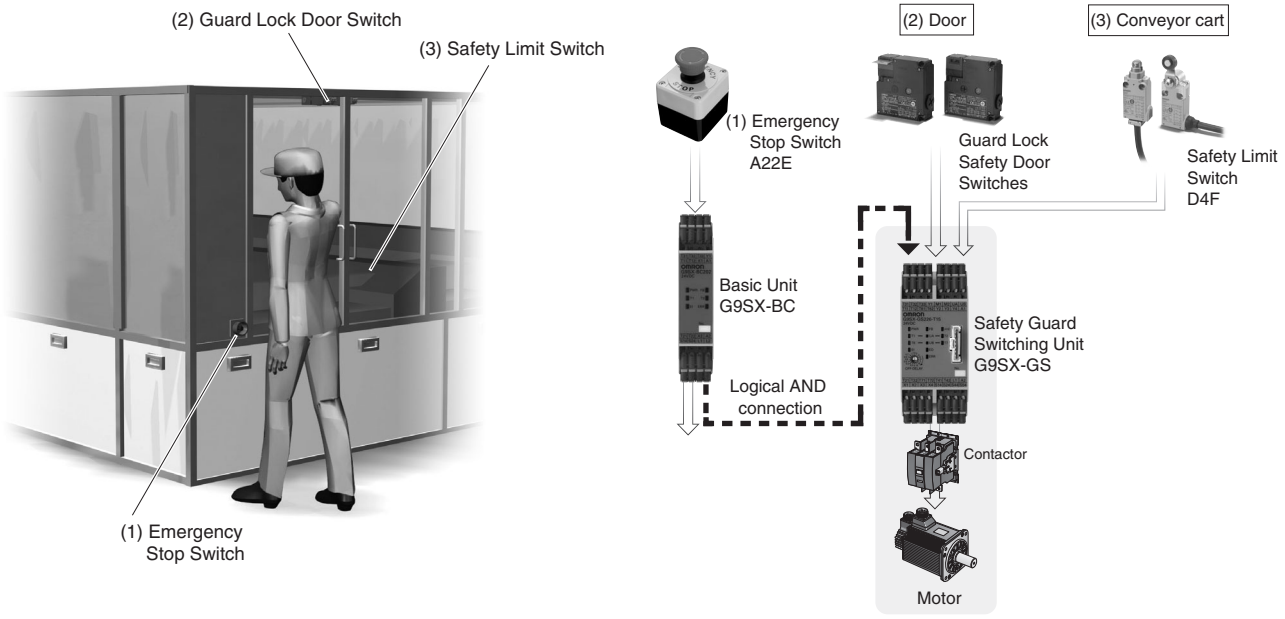
■ Timing chart

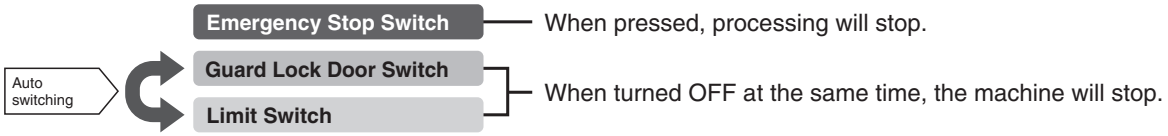


(1) In Normal operating mode, the lower unit starts.
(2) Maintenance mode is selected.
(3) The operator opens the door and performs maintenance operation.
(4) The Enabling Switch is gripped to the middle position.
(5) In maintenance mode, the lower unit starts.
(6) When the Enabling Switch is released or gripped, the lower unit stops.
(7) After closing the door and then switching to Normal operating mode, the lower unit will restart.
(8) If the door is opened while in Normal operating mode, the lower unit will stop.
(9) The door is closed, and the lower unit restarts.
(10) If the Emergency Stop Switch is pressed, the upper unit and lower unit will stop.

4-3 LCD Manufacturing (Guard Lock Control)

When the Safety Limit Switch has confirmed that the hazard source is in a safe position, the Guard Lock Safety Door Switch will be unlocked.




Emergency Stop Switch
When pressed, processing will stop.
Auto switching
Guard Lock Door Switch
Limit Switch
When turned OFF at the same time, the machine will stop.

Required Units

Unit	Qty.	Safety input to be applied	Page
G9SX-BC	1	Emergency Stop Switch	39
G9SX-GS	1	Guard Lock Door Switch + Limit Switch	44

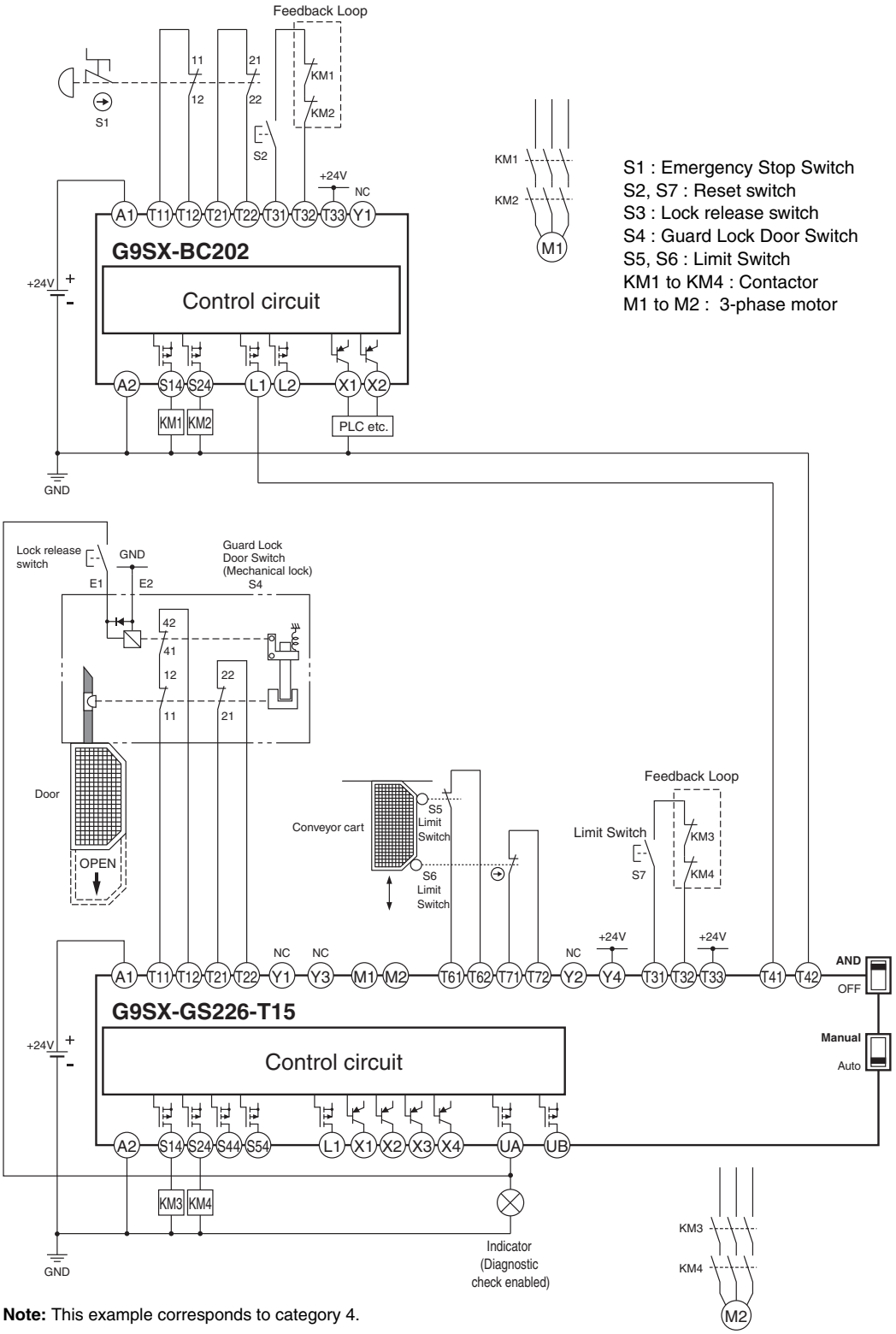
■ Wiring Example

Setup (For details, refer to Section 3.)

G9SX-BC: Manual reset, Cross fault detection mode: ON (Category 4 Wiring)

G9SX-GS: Manual reset, Cross fault detection mode: ON (Category 4 Wiring), Logical AND connections,
No OFF-delay time setting
Switching mode: Auto
Diagnostic check of Indicator: Enabled (UA only)

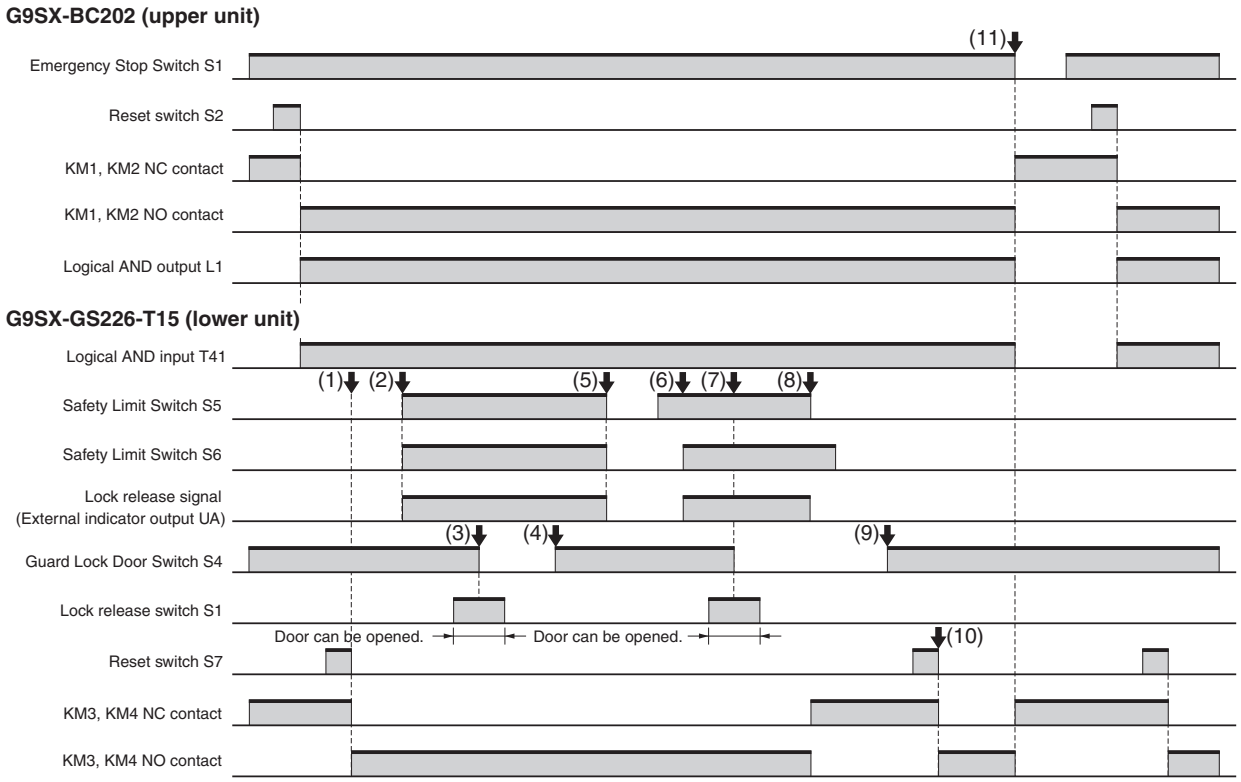
Wiring Example



Note: This example corresponds to category 4.

4. Safety Measures for limited operations

■ Timing chart



(1) When the door is closed, operation is initiated with the reset switch.
(2) The Limit Switch detects the conveyor cart and the lock release signal turns ON.
(3) The door can be opened while the lock release switch pressed.
(4) The door is closed again.
(5) The conveyor cart moves.
(6) The Limit Switch detects the conveyor cart, and the lock release signal turns ON.
(7) The door can be opened while the lock release switch is pressed.
(8) The conveyor cart moves while the door is open, and the lower unit stops.
(9) The door is closed again. The lower unit remains stopped.
(10) The reset switch is used to restart operation.
(11) If the Emergency Stop Switch is pressed, the upper unit and lower unit will stop.

Section 2

Functions of G9SX

1. Function list of G9SX-series	**38**
2. Functions of each Unit	**39**
2-1 Basic Unit	**39**
2-2 Advanced Unit	**40**
2-3 Non-Contact Door Switch Controller	**42**
2-4 Safety Guard Switching Unit	**44**
2-5 Expansion Unit	**48**

1. Function list of G9SX-series

Function	Model	G9SX-BC	G9SX-AD	G9SX-ADA	G9SX-NS	G9SX-NSA	G9SX-GS
Logical AND connections	Inputs	---	●	● (2 inputs)	●	●	●
	Outputs	●	●	●	●	●	●
Safety inputs	Emergency stop	●	●	●	---	●	---
	Door switch	●	●	●	---	●	●
	Non-contact door switch (D40A)	---	---	---	●	●	---
	Light curtain	●	●	●	---	---	●
Number of safety inputs		1	1	1	1	2	2
Safety outputs	Instantaneous outputs	2	3	2	2	2	2
	OFF-delayed outputs	---	2	2	---	2	2
	OFF-delay time	---	0 to 15 s, 0 to 150 s	0 to 15 s, 0 to 150 s	---	0 to 3 s	0 to 15 s
	Expansion Unit connection	---	●	●	---	●	●
Guard switching		---	---	---	---	---	●

2. Functions of each Unit

2-1 Basic Unit

It is possible to connect to other Units by using the logical AND connection output.

■ G9SX-BC□

Safety Inputs

Safety inputs	1 input (2-channel input)
Safety input devices	Emergency stop switch, door switch, light curtain

Safety Outputs (Semiconductor Outputs)

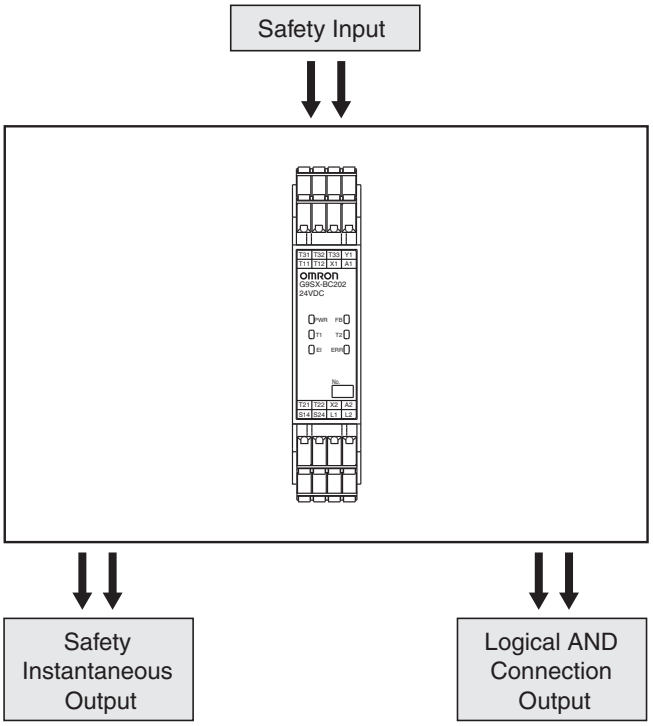
Instantaneous outputs	2 outputs
OFF-delayed outputs	None

Logical AND Connections

Number of inputs	None
Number of outputs	2 outputs

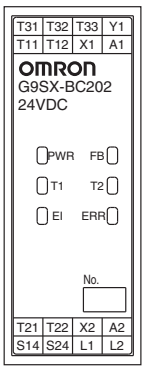
Required Settings and Wiring

Item	G9SX-BC	Page
Logical AND connection input enable/disable	---	---
Cross fault detection mode	❍	63
Reset mode	❍	62
OFF-delay time	---	---
Switching mode	---	---
External indicator fault diagnosis mode	---	---



LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
T1	Orange	Safety input #1 indicator
T2	Orange	Safety input #2 indicator
FB	Orange	Feedback/reset input indicator
EI	Orange	Safety output indicator
ERR	Red	Error indicator



2-2 Advanced Unit

This Unit has safety OFF-delayed outputs and can be connected to other Units using the logical AND connection input and output.

■ G9SX-AD□

Safety Inputs

Safety inputs	1 input (2-channel input)
Safety input devices	Emergency stop switch, door switch, light curtain

Safety Outputs (Semiconductor Outputs)

Instantaneous outputs	3 outputs
OFF-delayed outputs	2 outputs

Note: The OFF-delayed outputs can be used as instantaneous outputs by setting the OFF-delay time to 0 s.

Logical AND Connections

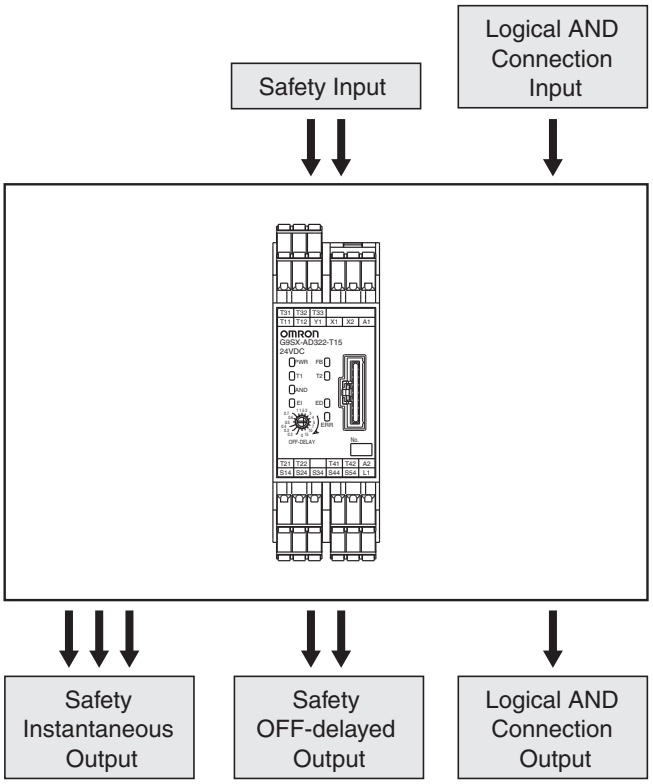
Number of inputs	1 input
Number of outputs	1 output

OFF-delay Time Setting

G9SX-AD322-T15-□	0 to 15 s
G9SX-AD322-T150-□	0 to 150 s

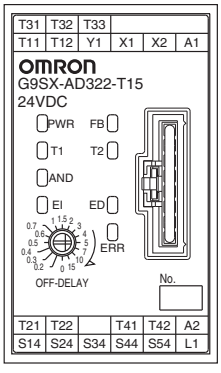
Required Settings and Wiring

Item	G9SX-AD	Page
Logical AND connection input enable/disable	❍	57
Cross fault detection mode	❍	63
Reset mode	❍	62
OFF-delay time	❍	65
Switching mode	---	---
External indicator fault diagnosis mode	---	---



LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
T1	Orange	Safety input #1 indicator
T2	Orange	Safety input #2 indicator
FB	Orange	Feedback/reset input indicator
AND	Orange	Logical AND input indicator
EI	Orange	Safety output indicator
ED	Orange	OFF-delayed safety output indicator
ERR	Red	Error indicator



■ G9SX-ADA□

Safety Inputs

Safety inputs	1 input (2-channel input)
Safety input devices	Emergency stop switch, door switch, light curtain

Safety Outputs (Semiconductor Outputs)

Instantaneous outputs	2 outputs
OFF-delayed outputs	2 outputs

Note: The OFF-delayed outputs can be used as instantaneous outputs by setting the OFF-delay time to 0 s.

Logical AND Connections

Number of inputs	2 inputs
Number of outputs	2 outputs

OFF-delay Time Setting

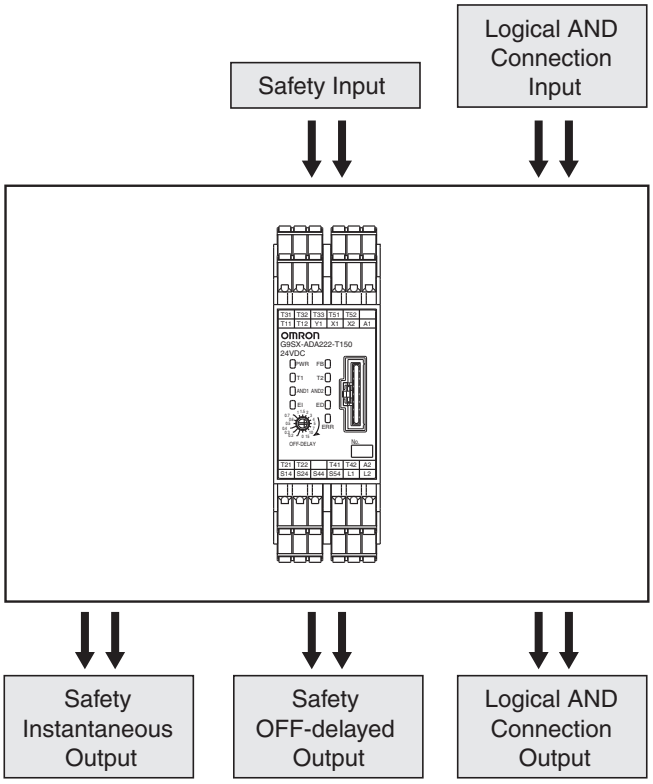
G9SX-ADA222-T15-□	0 to 15 s
G9SX-ADA222-T150-□	0 to 150 s

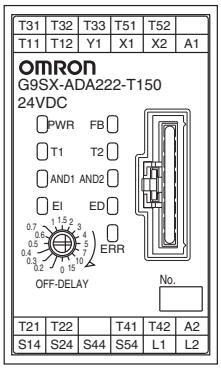
Required Settings and Wiring

Item	G9SX-ADA	Page
Logical AND connection input enable/disable	❍	57
Cross fault detection mode	❍	63
Reset mode	❍	62
OFF-delay time	❍	65
Switching mode	---	---
External indicator fault diagnosis mode	---	---

LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
T1	Orange	Safety input #1 indicator
T2	Orange	Safety input #2 indicator
FB	Orange	Feedback/reset input indicator
AND1	Orange	Logical AND input indicator
AND2	Orange	Logical AND input indicator
EI	Orange	Safety output indicator
ED	Orange	OFF-delayed safety output indicator
ERR	Red	Error indicator





2-3 Non-Contact Door Switch Controller

This is a Special Controller for D40A Non-contact Door Switch. It can be connected to other Units using the logical AND connection input and output.

■ G9SX-NS□

Safety Inputs

Safety inputs	1 input (2-channel input)
Safety input devices	Non-contact door switch (D40A)

Safety Outputs (Semiconductor Outputs)

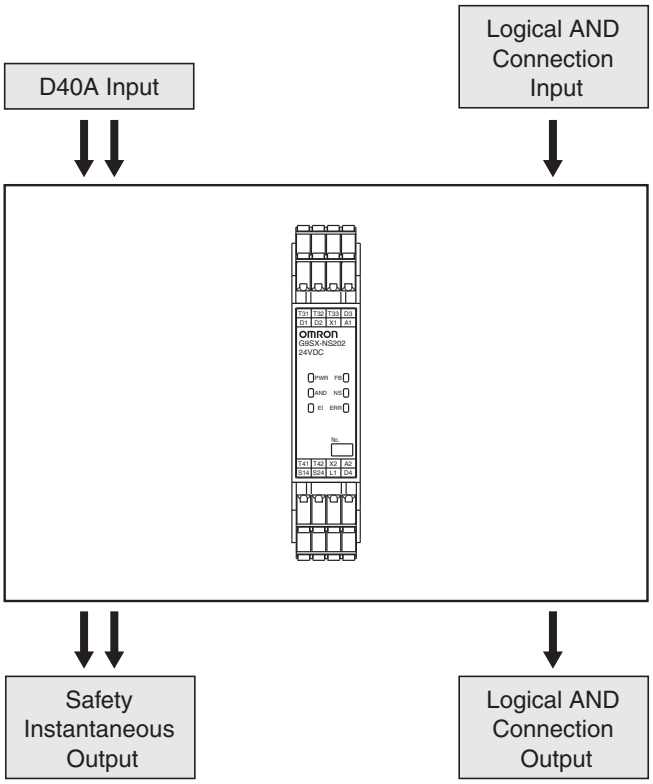
Instantaneous outputs	2 outputs
OFF-delayed outputs	None

Logical AND Connections

Number of inputs	1 input
Number of outputs	1 output

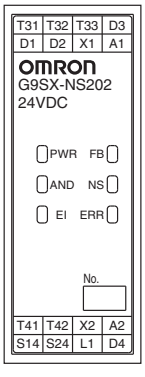
Required Settings and Wiring

Item	G9SX-NS	Page
Logical AND connection input enable/disable	❍	57
Cross fault detection mode	---	---
Reset mode	❍	62
OFF-delay time	---	---
Switching mode	---	---
External indicator fault diagnosis mode	---	---



LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
NS	Orange	Non-contact Door Switch input indicator
FB	Orange	Feedback/reset input indicator
AND	Orange	Logical AND input indicator
EI	Orange	Instantaneous safety output indicator
ERR	Red	Error indicator



■ G9SX-NSA□

Safety Inputs

Safety inputs	2 inputs (each with 2 channels)
Safety input devices	Non-contact door switch (D40A), emergency stop switch, door switch

Safety Outputs (Semiconductor Outputs)

Instantaneous outputs	2 outputs
OFF-delayed outputs	2 outputs

Note: The OFF-delayed outputs can be used as instantaneous outputs by setting the OFF-delay time to 0 s.

Logical AND Connections

Number of inputs	1 input
Number of outputs	1 output

OFF-delay Time Setting

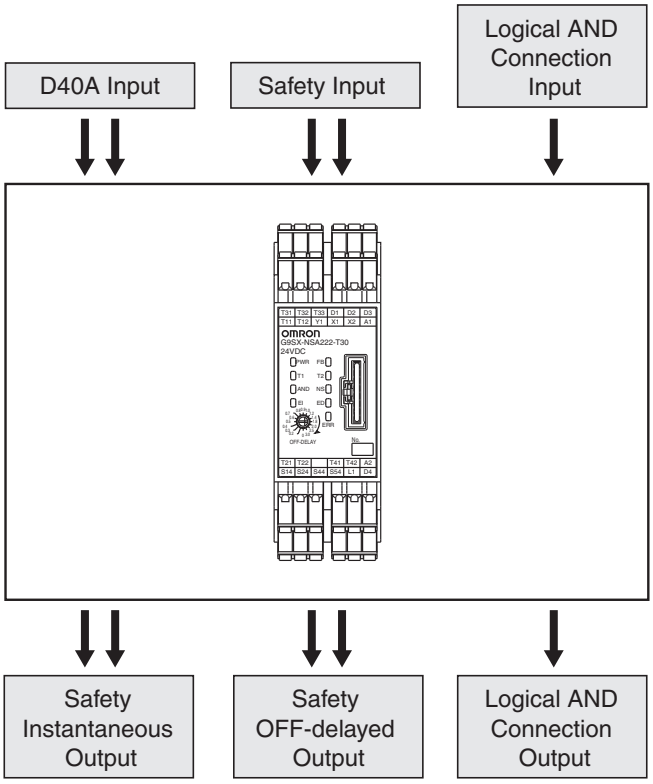
G9SX-NSA222-T03-□	0 to 3 s

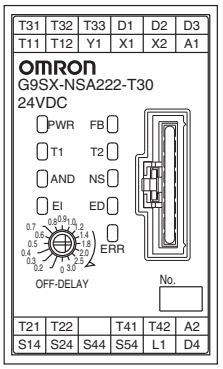
Required Settings and Wiring

Item	G9SX-NSA	Page
Logical AND connection input enable/disable	❍	57
Cross fault detection mode	❍	63
Reset mode	❍	62
OFF-delay time	❍	65
Switching mode	---	---
External indicator fault diagnosis mode	---	---

LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
T1	Orange	Safety input #1 indicator
T2	Orange	Safety input #2 indicator
NS	Orange	Non-contact Door Switch input indicator
FB	Orange	Feedback/reset input indicator
AND	Orange	Logical AND input indicator
EI	Orange	Instantaneous safety output indicator
ED	Orange	OFF-delayed safety output indicator
ERR	Red	Error indicator





2-4 Safety Guard Switching Unit

This Unit can alternately enable two safety inputs. It can be used to construct safety systems for semi-automatic processing and maintenance work.

■ G9SX-GS□

Safety Inputs

Safety inputs	2 inputs (each with 2 channels)
Safety input devices	Door switch, light curtain

Safety Outputs (Semiconductor Outputs)

Instantaneous outputs	2 outputs
OFF-delayed outputs	2 outputs

Note: The OFF-delayed outputs can be used as instantaneous outputs by setting the OFF-delay time to 0 s.

Logical AND Connections

Number of inputs	1 input
Number of outputs	1 output

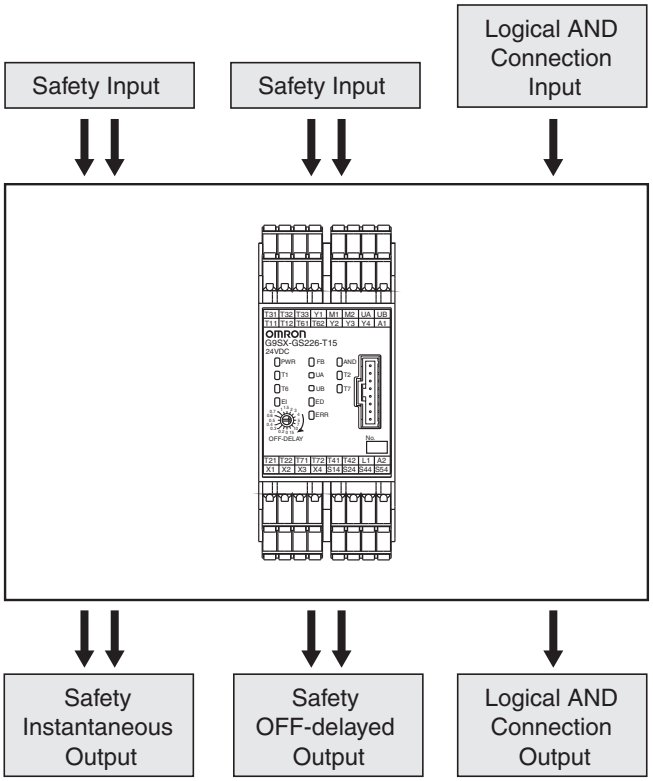
OFF-delay Time Setting

G9SX-GS226-T15-□	0 to 15 s

Required Settings and Wiring

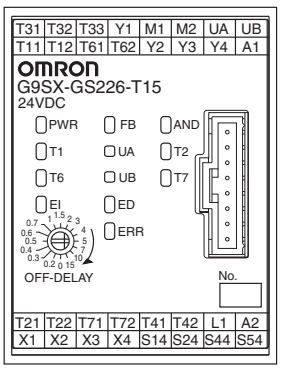
Item	G9SX-GS	Page
Logical AND connection input enable/disable	❍	57
Cross fault detection mode	❍	63
Reset mode	❍	62
OFF-delay time	❍	65
Switching mode	❍	67
External indicator fault diagnosis mode	❍	68

Note: Carefully read the *Precautions* on pages 96 to 99 before configuring a system using the G9SX-GS.



LED Indicators

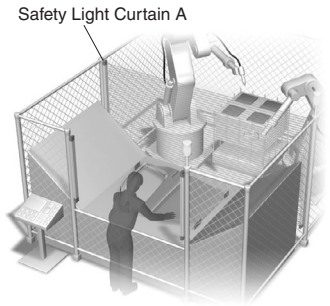
Marking	Color	Name
PWR	Green	Power supply indicator
T1	Orange	Safety input A, channel 1 indicator
T2	Orange	Safety input A, channel 2 indicator
T6	Orange	Safety input B, channel 1 indicator
T7	Orange	Safety input B, channel 2 indicator
FB	Orange	Feedback/reset input indicator
AND	Orange	Logical AND input indicator
EI	Orange	Safety output indicator
ED	Orange	OFF-delayed safety output indicator
UA	Orange	Safety input A disabled state indicator
UB	Orange	Safety input B disabled state indicator
ERR	Red	Error indicator



Functions

Auto Switching Function

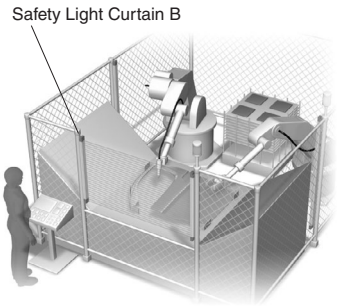
When the operator inserts the workpiece...



- Safety Light Curtain A monitors the robot.
- The robot can continue to operate as long as it does not interrupt Safety Light Curtain A.

Auto switching

While the robot processes the workpiece...

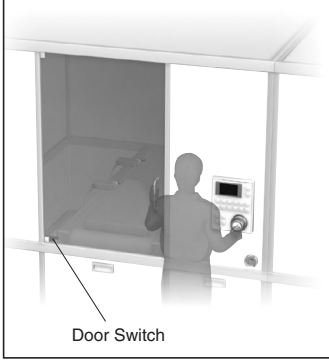


- Safety Light Curtain B monitors the operator.
- The robot can continue to operate as long as the operator does not interrupt Safety Light Curtain B.

Note: If the operator is able to completely enter the zone inside Safety Light Curtain B, a presence detection device, such as a Safety Mat, is necessary as an additional safety measure.

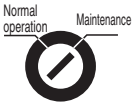
Manual Switching Function

During normal operation...

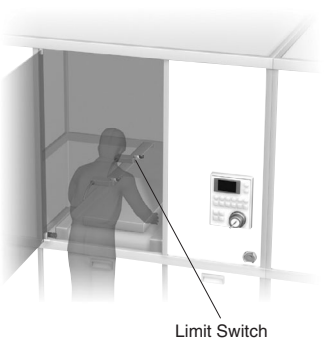


- The Door Switch monitors the opening and closing of the door during normal operation.
- The machine is able to operate while the door is closed.

Manual switching



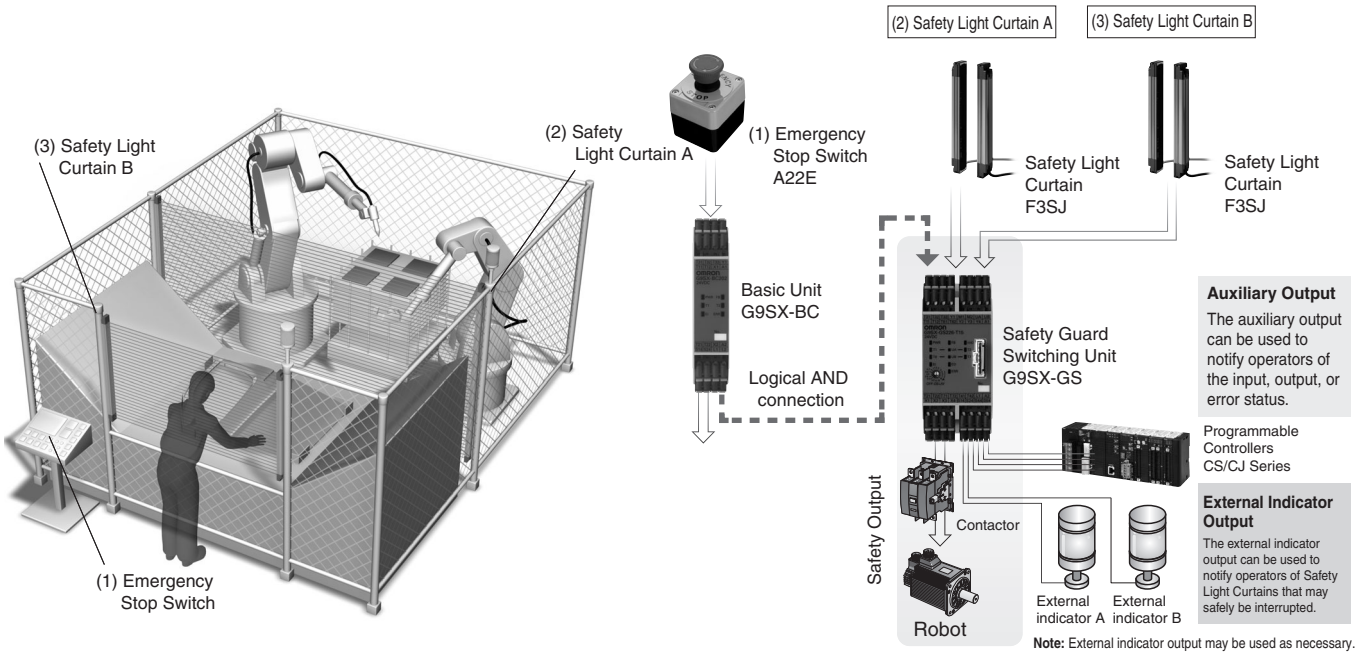
During maintenance...



- The Limit Switch monitors the conveyor cart position during maintenance.
- The machine is able to operate while the conveyor cart is in a specified area.

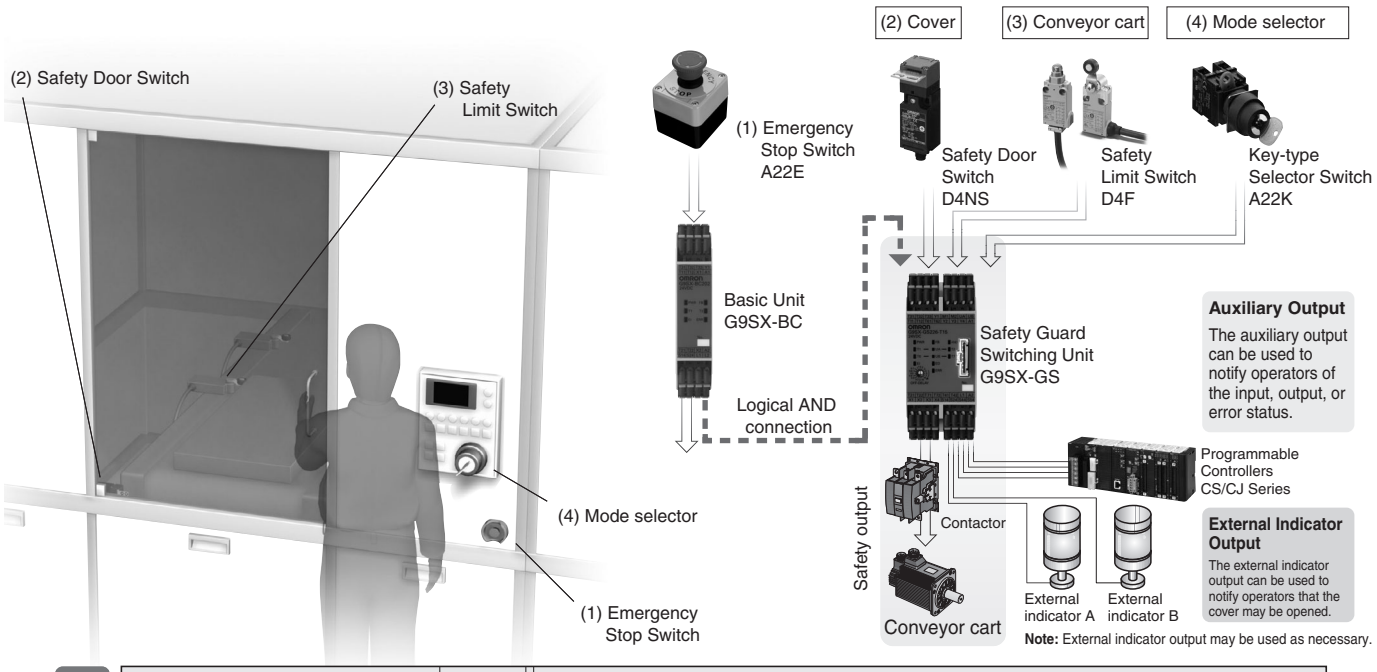
2. Functions of each Unit

Auto Switching Function


(3) Safety Light Curtain B
(2) Safety Light Curtain A
(1) Emergency Stop Switch A22E
(1) Emergency Stop Switch
(2) Safety Light Curtain A
(3) Safety Light Curtain B
Safety Light Curtain F3SJ
Safety Light Curtain F3SJ
Basic Unit G9SX-BC
Logical AND connection
Safety Guard Switching Unit G9SX-GS
Auxiliary Output
The auxiliary output can be used to notify operators of the input, output, or error status.
Programmable Controllers CS/CJ Series
Safety Output
Contactor
External indicator A
External indicator B
External Indicator Output
The external indicator output can be used to notify operators of Safety Light Curtains that may safely be interrupted.
Robot
Note: External indicator output may be used as necessary.

	Working condition	External indicator	G9SX-GS Safety input	G9SX-GS Safety output	G9SX-GS Monitor output	G9SX-GS External indicator
Normal operation	1	OK to work	Safety input A: ON Safety input B: ON	ON Safety output	ON Input A monitor ON Input B monitor	Indicator A Indicator B
Normal operation	2	OK to work	Safety input A: ON Safety input B: OFF	ON Safety output	ON Input A monitor OFF Input B monitor	Indicator A Indicator B
Normal operation	3	Not OK to work	Safety input A: OFF Safety input B: ON	ON Safety output	OFF Input A monitor ON Input B monitor	Indicator A Indicator B
Hazardous condition	4	Not OK to work	Safety input A: OFF Safety input B: OFF	OFF Safety output	OFF Input A monitor OFF Input B monitor	Indicator A Indicator B

Manual Switching Function


(2) Safety Door Switch
(3) Safety Limit Switch
(4) Mode selector
(1) Emergency Stop Switch
(1) Emergency Stop Switch A22E
Basic Unit G9SX-BC
Logical AND connection
(2) Cover
(3) Conveyor cart
(4) Mode selector
Safety Door Switch D4NS
Safety Limit Switch D4F
Key-type Selector Switch A22K
Safety Guard Switching Unit G9SX-GS
Auxiliary Output
The auxiliary output can be used to notify operators of the input, output, or error status.
Programmable Controllers CS/CJ Series
Safety output
Contactor
External indicator A
External indicator B
External Indicator Output
The external indicator output can be used to notify operators that the cover may be opened.
Conveyor cart
Note: External indicator output may be used as necessary.

	Working condition	External indicator	G9SX-GS Safety input	G9SX-GS Safety output	G9SX-GS Mode selector	G9SX-GS Monitor output	G9SX-GS External indicator
Normal operation	1	Not OK to open	Safety input A: Disabled Safety input B: ON	ON Safety output	Normal operating mode	OFF Input A monitor ON Input B monitor	Indicator A Indicator B
Maintenance	2	OK to open	Safety input A: ON Safety input B: Disabled	ON Safety output	Maintenance mode	ON Input A monitor OFF Input B monitor	Indicator A Indicator B
Maintenance	3	OK to open	Safety input A: ON Safety input B: Disabled	ON Safety output	Maintenance mode	ON Input A monitor OFF Input B monitor	Indicator A Indicator B
Hazardous condition	4	OK to open	Safety input A: OFF Safety input B: Disabled	OFF Safety output	Maintenance mode	OFF Input A monitor OFF Input B monitor	Indicator A Indicator B

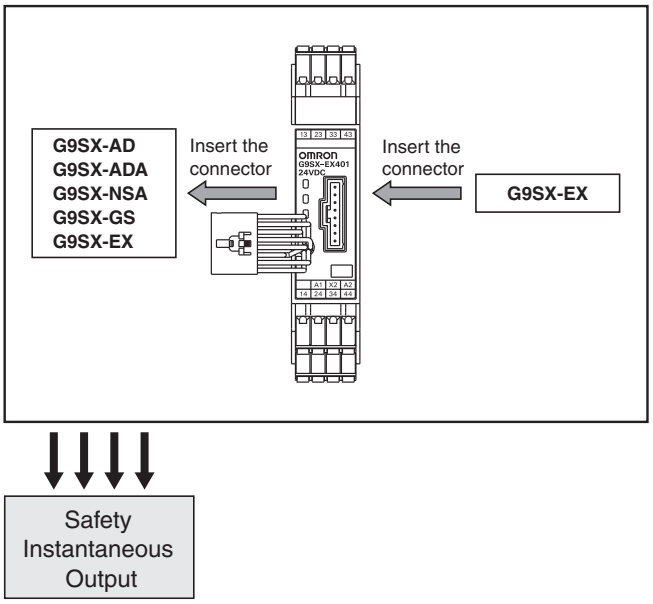
2-5 Expansion Unit

By connecting an Expansion Unit to the G9SX-AD/ADA, G9SX-NSA, or G9SX-GS, safety relay contact outputs can be added that are synchronized with the safety outputs of the Unit to which the Expansion Unit is connected.

■ G9SX-EX-□

Safety Outputs (Safety Relay Outputs)

Instantaneous outputs	4 outputs
OFF-delayed outputs	None



Logical AND Connections

Number of inputs	None
Number of outputs	None

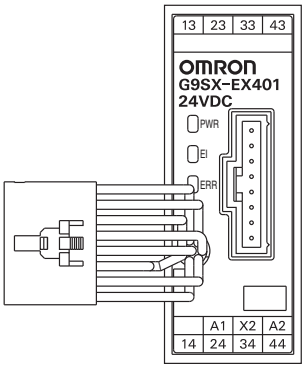
Required Settings and Wiring

Item	G9SX-EX	Page
Logical AND connection input enable/disable	---	---
Cross fault detection mode	---	---
Reset mode	---	---
OFF-delay time	---	---
Switching mode	---	---
External indicator fault diagnosis mode	---	---

Note: Refer to *2-10 Connecting Expansion Units* on page 69.

LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
EI	Orange	Safety output indicator
ERR	Red	Error indicator



■ G9SX-EX-T□

Safety Outputs (Safety Relay Outputs)

Instantaneous outputs	None
OFF-delayed outputs	4 outputs

Logical AND Connections

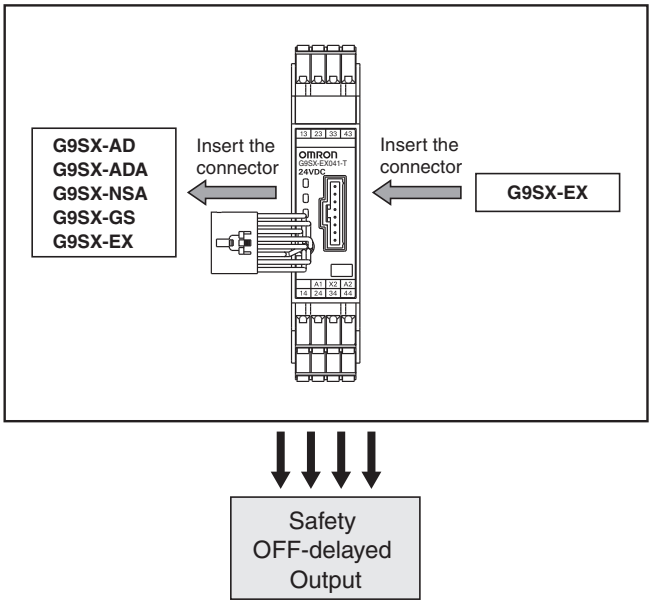
Number of inputs	None
Number of outputs	None

Required Settings and Wiring

Item	G9SX-EX-T	Page
Logical AND connection input enable/disable	---	---
Cross fault detection mode	---	---
Reset mode	---	---
OFF-delay time	--- (See note)	65
Switching mode	---	---
External indicator fault diagnosis mode	---	---

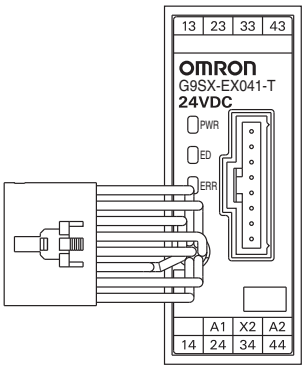
Note: 1. The OFF-delay time on G9SX-EX-T is set from the OFF-delay preset time on the connected unit (G9SX-AD/-ADA/-NSA/-GS).

2. Refer to *2-10 Connecting Expansion Units* on page 69.



LED Indicators

Marking	Color	Name
PWR	Green	Power supply indicator
ED	Orange	OFF-delayed safety output indicator
ERR	Red	Error indicator



MEMO

Section 3

Wiring and Setup

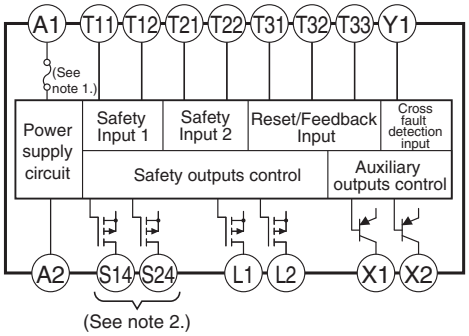
1. I/O Terminals	**52**
1-1 Basic Unit	52
1-2 Advanced Unit	53
1-3 Non-contact Door Switch Controller	54
1-4 Safety Guard Switching Unit	55
1-5 Expansion Unit	56
2. Functions, Wiring and Settings	**57**
2-1 Logical AND Connection	57
2-2 Response Time and Operation Time	60
2-3 Reset Mode	62
2-4 Cross Fault Detection	63
2-5 Connecting Safety Sensors and the G9SX	64
2-6 OFF-delay Time	65
2-7 Non-contact Door Switch	66
2-8 Switching Mode	67
2-9 External Indicator Fault Diagnosis	68
2-10 Connecting Expansion Units	69
2-11 Confirming Settings	70

1. I/O Terminals

1-1 Basic Unit

Signal name	Terminal name	Wiring
Power supply inputs	A1, A2	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Safety inputs	T11, T12, T21, T22	Refer to *2-4 Cross Fault Detection* and *2-5 Connecting Safety Sensors and the G9SX.*
Feedback/reset inputs	T31, T32, T33	Refer to *2-3 Reset Mode.*
Cross fault detection input	Y1	Refer to *2-4 Cross Fault Detection*.
Instantaneous safety outputs	S14, S24	Keep these outputs open when they are not used.
Logical AND connection output	L1, L2	Refer to *2-1 Logical AND Connection*.
Auxiliary monitor outputs	X1, X2	Keep these outputs open when they are not used.

G9SX-BC

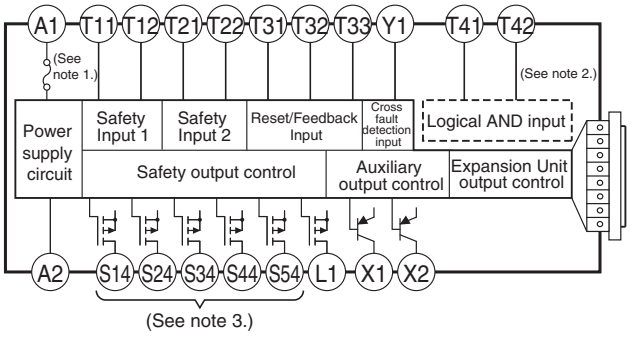


Note: 1. Internal power supply circuit is not isolated.
2. Outputs S14 and S24 are internally redundant.

1-2 Advanced Unit

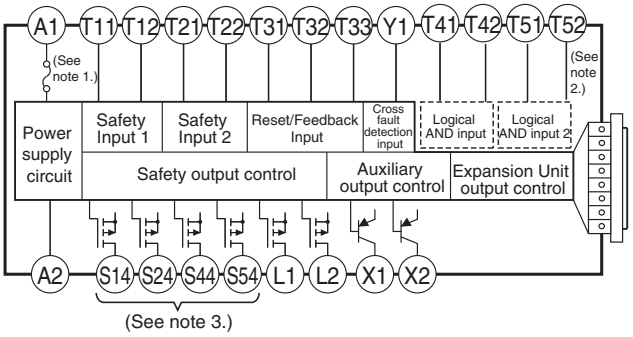
Signal name	Terminal name	Wiring
Power supply inputs	A1, A2	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Safety inputs	T11, T12, T21, T22	Refer to *2-4 Cross Fault Detection* and *2-5 Connecting Safety Sensors and the G9SX*
Feedback/reset inputs	T31, T32, T33	Refer to *2-3 Reset Mode.*
Logical AND connection inputs	T41, T42, T51, T52	Refer to *2-1 Logical AND Connection*.
Cross fault detection input	Y1	Refer to *2-4 Cross Fault Detection*.
Instantaneous safety outputs	S14, S24, S34	Keep these outputs open when they are not used.
OFF-delayed safety outputs	S44, S54	Keep these outputs open when they are not used.
Logical AND connection output	L1, L2	Refer to *2-1 Logical AND Connection*.
Auxiliary monitor outputs	X1, X2	Keep these outputs open when they are not used.

G9SX-AD



Note: 1. Internal power supply circuit is not isolated.
2. Logical AND input is isolated.
3. Outputs S14 to S54 are internally redundant.

G9SX-ADA

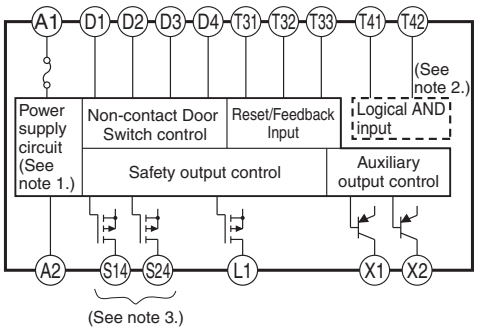


Note: 1. Internal power supply circuit is not isolated.
2. Logical AND input is isolated.
3. Outputs S14 to S54 are internally redundant.

1-3 Non-contact Door Switch Controller

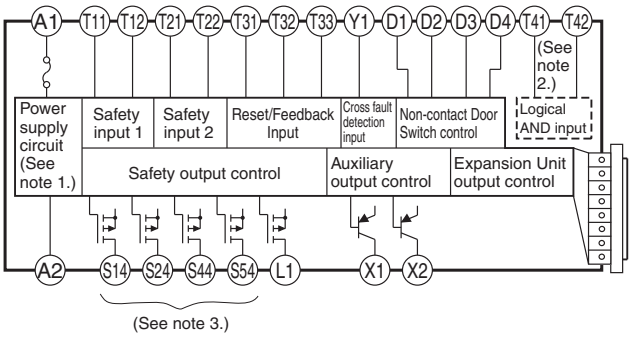
Signal name	Terminal name	Wiring
Power supply inputs	A1, A2	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Safety inputs	T11, T12, T21, T22	Refer to *2-4 Cross Fault Detection* and *2-5 Connecting Safety Sensors and the G9SX.*
Non-contact Door Switch (D40A) inputs	D1, D2, D3, D4	Refer to *2-7 Non-contact Door Switch.*
Feedback/reset inputs	T31, T32, T33	Refer to *2-3 Reset Mode.*
Logical AND connection inputs	T41, T42	Refer to *2-1 Logical AND Connection.*
Cross fault detection input	Y1	Refer to *2-4 Cross Fault Detection.*
Instantaneous safety outputs	S14, S24	Keep these outputs open when they are not used.
OFF-delayed safety outputs	S44, S54	Keep these outputs open when they are not used.
Logical AND connection output	L1	Refer to *2-1 Logical AND Connection.*
Auxiliary monitor outputs	X1, X2	Keep these outputs open when they are not used.

G9SX-NS



Note: 1. Internal power supply circuit is not isolated.
2. Logical AND input is isolated.
3. Outputs S14 to S24 are internally redundant.

G9SX-NSA

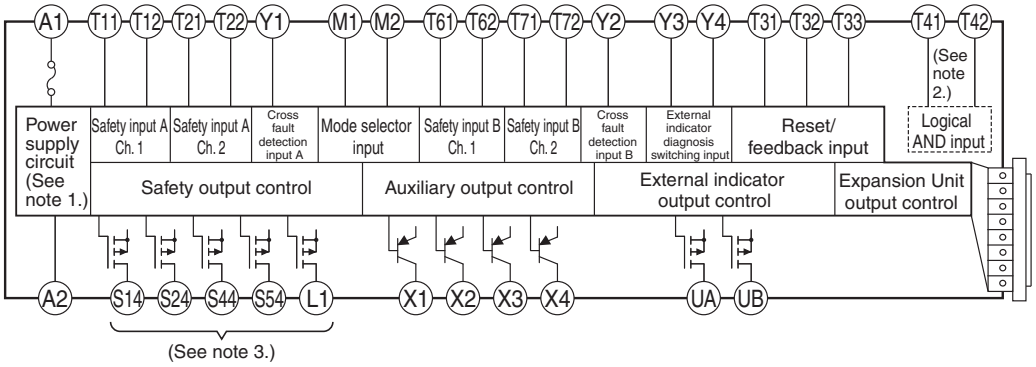


Note: 1. Internal power supply circuit is not isolated.
2. Logical AND input is isolated.
3. Outputs S14 to S54 are internally redundant.

1-4 Safety Guard Switching Unit

Signal name	Terminal name	Wiring
Power supply inputs	A1, A2	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Safety inputs A	T11, T12, T21, T22	Refer to *2-4 Cross Fault Detection* and *2-5 Connecting Safety Sensors and the G9SX*.
Safety inputs B	T61, T62, T71, T72	
Mode switching inputs	M1, M2	Refer to *2-8 Switching Mode*.
Feedback/reset inputs	T31, T32, T33	Refer to *2-3 Reset Mode*.
Logical AND connection inputs	T41, T42	Refer to *2-1 Logical AND Connection*.
Cross fault detection inputs	Y1, Y2	Refer to *2-4 Cross Fault Detection*.
Instantaneous safety outputs	S14, S24	Keep these outputs open when they are not used.
OFF-delayed safety outputs	S44, S54	Keep these outputs open when they are not used.
Logical AND connection output	L1	Refer to *2-1 Logical AND Connection*.
Auxiliary monitor outputs	X1, X2, X3, X4	Keep these outputs open when they are not used.
External indicator outputs	UA, UB	Refer to *2-9 External Indicator Fault Diagnosis*.
External indicator diagnosis switching inputs	Y3, Y4	Refer to *2-9 External Indicator Fault Diagnosis*.

G9SX-GS



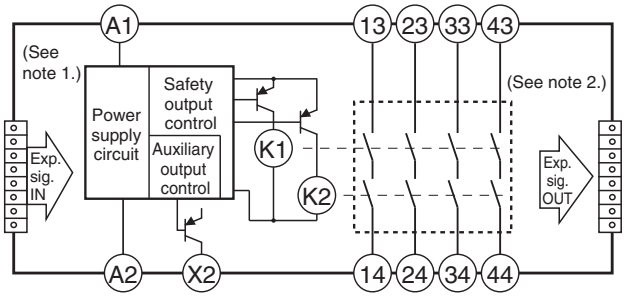
Note: 1. Internal power supply circuit is not isolated.
2. Logical AND input is isolated.
3. Outputs S14 to S54 and L1 are internally redundant.

1-5 Expansion Unit

Signal name	Terminal name	Wiring
Power supply inputs	A1, A2	Connect the power supply plus (24 VDC) to the A1 terminal. Connect the power supply minus (GND) to the A2 terminal.
Safety outputs (See note.)	13-14, 23-24, 33-34, 43-44	Keep these outputs open when not used.

Note: The safety outputs are instantaneous safety outputs for the G9SX-EX401, and OFF-delayed safety outputs for the G9SX-EX041-T.

G9SX-EX401/G9SX-EX041-T



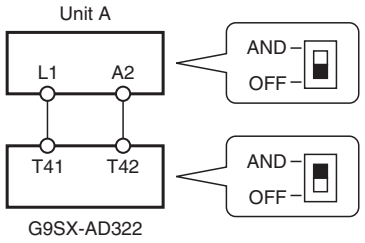
Note: 1. Internal power supply circuit is not isolated.
2. Relay outputs are isolated.

2. Functions, Wiring and Settings

2-1 Logical AND Connection

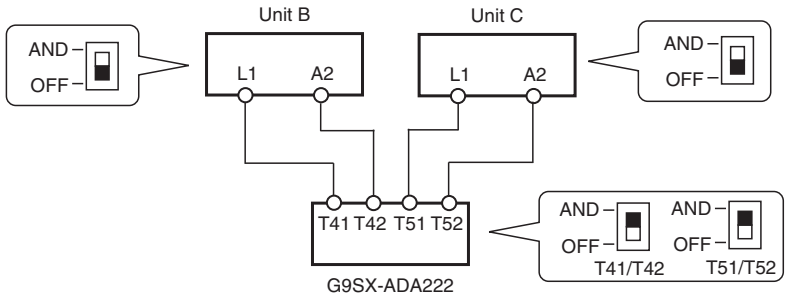
When connecting two or more Units using a logical AND connection, the logical AND connection setting is performed on the Unit on the input side. Set the logical AND connection preset switch on the Unit that is on the input side (G9SX-AD322 in the below diagram) to AND.

1. When the G9SX-AD/-NS/-NSA/-GS Is on the Input Side



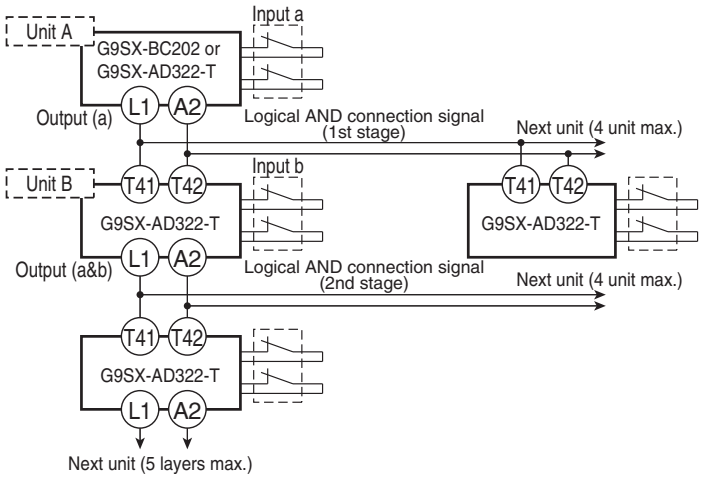
Note: 1. In the above diagram, a setting error will occur and G9SX-AD322 will set a lock out if the logical AND setting switch on G9SX-AD322 is set to OFF. Set the switch carefully.
2. Set the logical AND setting switch on Unit A to OFF.
3. A logical AND input cannot be input to the G9SX-BC.

2. When the G9SX-ADA Is on the Input Side



Note: 1. When not connecting Unit B, leave terminals T41 and T42 of the G9SX-ADA222 Unit open, and set the logical AND setting switch T41/T42 to OFF.
2. When not connecting Unit C, leave terminals T51 and T52 of the G9SX-ADA222 Unit open, and set the logical AND setting switch to OFF.

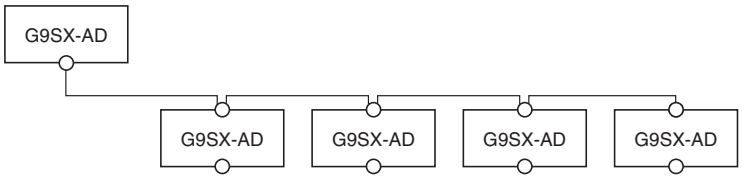
When connecting multiple Units to the input side, follow the wiring example in the following diagram.



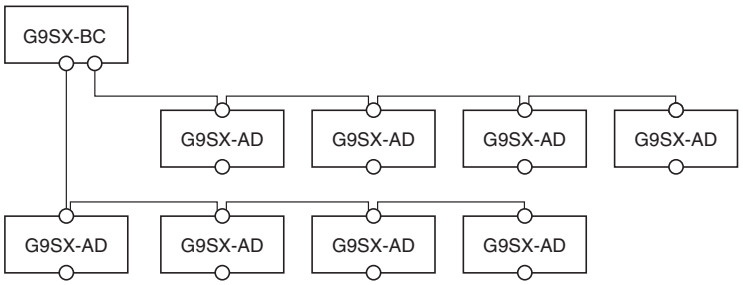
Note: When a logical AND connection is not used, keep the logical AND connection inputs (terminals T41, T42, T51, and T52) and logical AND connection outputs (terminals L1 and L2) open, and set the logical AND setting switch to OFF.

3. Logical AND Connection Combinations

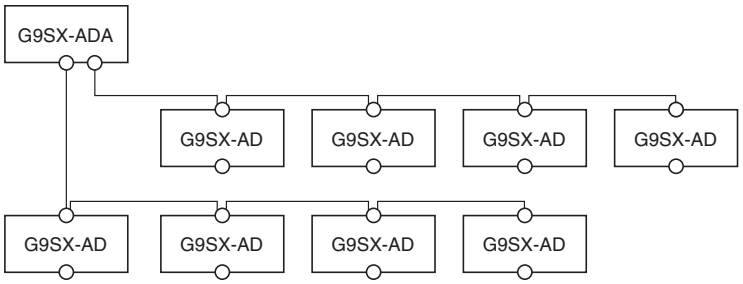
(1) One logical AND connection output from an Advanced Unit G9SX-AD can be logical AND connected to up to four Advanced Units.



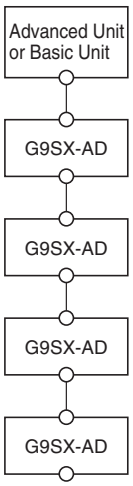
(2) Two logical AND outputs from a Basic Unit G9SX-BC can be logical AND connected to up to eight Advanced Units.



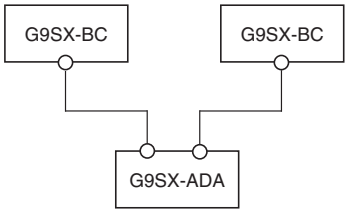
(3) Two logical AND outputs from an Advanced Unit G9SX-ADA can be logical AND connected to up to eight Advanced Units.



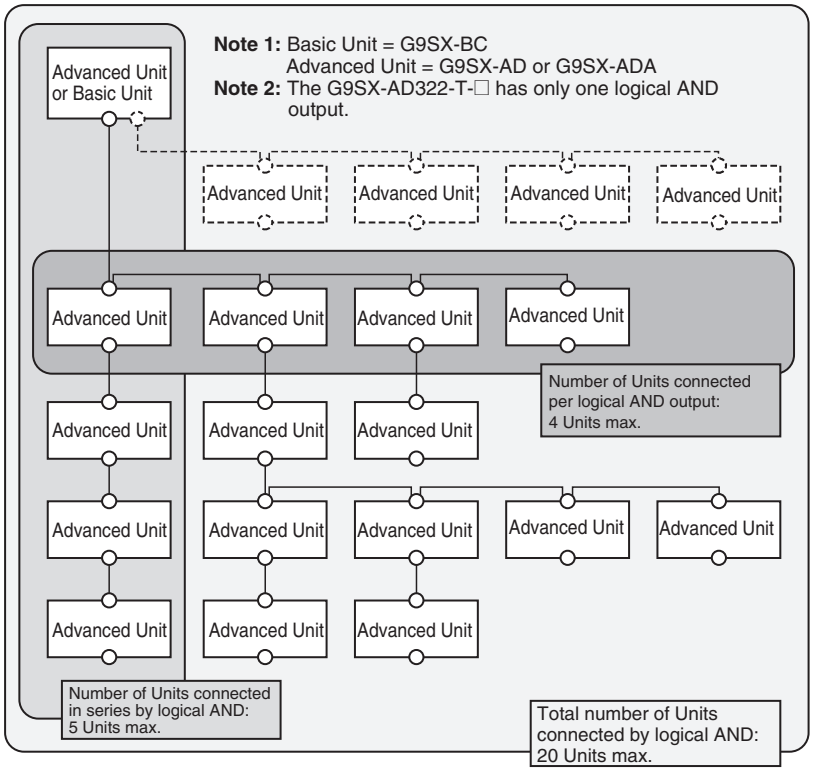
(4) Any Advanced Unit with logical AND input can be logical AND connected to Advanced Units on up to five tiers.



(5) Two logical AND connection outputs, each from different Advanced/Basic Units, can be logical AND connected to a single G9SX-ADA Unit.



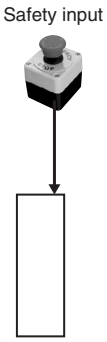
(6) The largest possible system configuration contains a total of 20 Advanced and Basic Units. In this configuration, each Advanced Unit can have up to five Expansion Units.


Note 1: Basic Unit = G9SX-BC
Advanced Unit = G9SX-AD or G9SX-ADA
Note 2: The G9SX-AD322-T-□ has only one logical AND output.
Advanced Unit or Basic Unit
Advanced Unit
Number of Units connected per logical AND output: 4 Units max.
Number of Units connected in series by logical AND: 5 Units max.
Total number of Units connected by logical AND: 20 Units max.

Note: The section on Advanced Units, above, can also be replaced with G9SX-NS/-NSA/-GS.

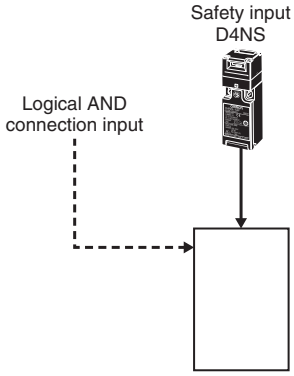
2-2 Response Time and Operation Time

(1) G9SX-BC



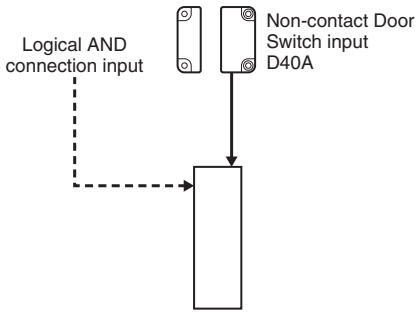
	Max. response time (excluding Expansion Units) (See note 1.)	Max. operating time (excluding Expansion Units) (See note 2.)
Safety input	15 ms	50 ms

(2) G9SX-AD/ADA



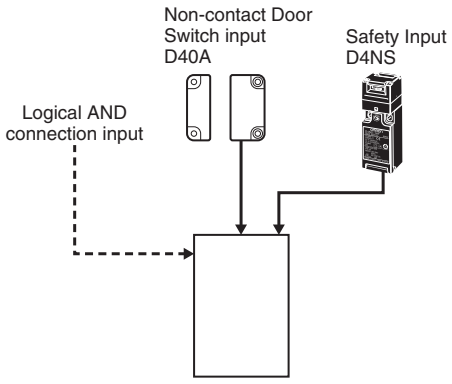
	Max. response time (excluding Expansion Units) (See note 1.)	Max. operating time (excluding Expansion Units) (See note 2.)
Safety input	15 ms	50 ms
Logical AND connection input	15 ms	100 ms

(3) G9SX-NS



	Max. response time (excluding Expansion Units) (See note 1.)	Max. operating time (excluding Expansion Units) (See note 2.)
Non-contact Door Switch input	20 ms	100 ms
Logical AND connection input	15 ms	100 ms

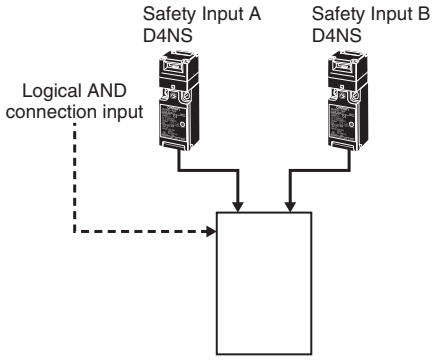
(4) G9SX-NSA



	Max. response time (excluding Expansion Units) (See note 1.)	Max. operating time (excluding Expansion Units) (See note 2.)
Non-contact Door Switch input	20 ms	100 ms
Safety input	15 ms	50 ms
Logical AND connection input	15 ms	100 ms

Note: 1. The maximum response time is the time it takes the output to turn OFF after the input turns OFF.
2. The maximum operating time is the time it takes the output to turn ON after the input turn ON.

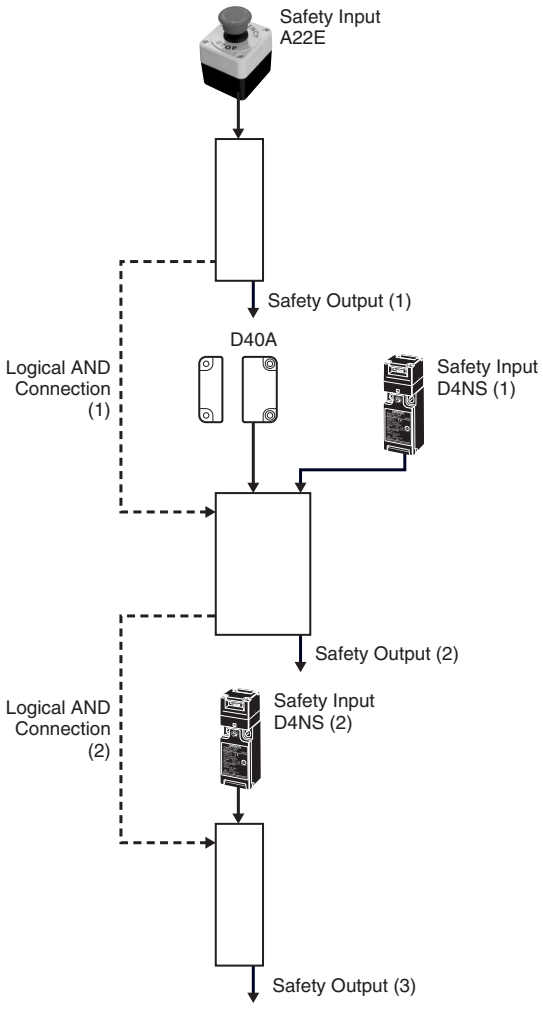
(5) G9SX-GS



	Max. response time (excluding Expansion Units) (See note 1.)	Max. operating time (excluding Expansion Units) (See note 2.)
Safety input A	15 ms (See note 3.)	50 ms
Safety input B	15 ms (See note 3.)	50 ms
Logical AND connection input	15 ms	100 ms

Note: 1. The maximum response time is the time it takes the output to turn OFF after the input turns OFF.
2. The maximum operating time is the time it takes the output to turn ON after the input turn ON.
3. The maximum response time exists when safety input A or safety input B is enabled.

(6) When two or more Units are connected using a logical AND connection.



Case 1

Response Time from When A22E Turns OFF until Safety Output 2 Turns OFF

15 ms (A22E) + 15 ms (Logical AND Connection (1)) = 30 ms

Case 2

Response Time from When D40A Turns OFF until Safety Output 3 Turns OFF

20 ms (D40A) + 15 ms (Logical AND Connection (2)) = 35 ms

Case 3

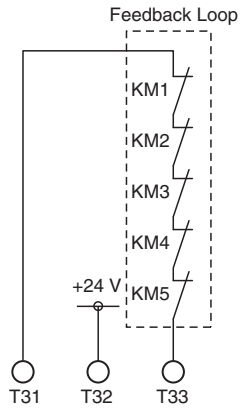
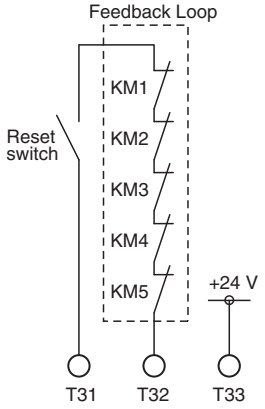
Response Time from When A22E Turns OFF until Safety Output 3 Turns OFF

15 ms (A22E) + 15 ms (Logical AND Connection (1)) + 15 ms (Logical AND Connection (2)) = 45 ms

Note: The operation time is calculated in a similar fashion.

2-3 Reset Mode

Set the reset mode using feedback/reset input terminals T31, T32, and T33.

Reset mode	Wiring	Function summary
Auto reset mode		The signal to terminal T33 must be ON for the safety output to turn ON. If terminal T33 is not ON, the safety output will not turn ON.
Manual reset mode		The signal to terminal T32 must turn ON and then OFF for the safety output to turn ON. If terminal T32 does not turn ON and then OFF, the safety output will not turn ON.

2-4 Cross Fault Detection

The cross fault detection setting for the safety input is made using the cross fault detection input (terminals Y1 and Y2).

Cross fault detection mode	Cross fault detection input
ON	Open
OFF	Connect to +24 V

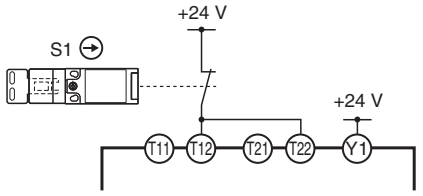
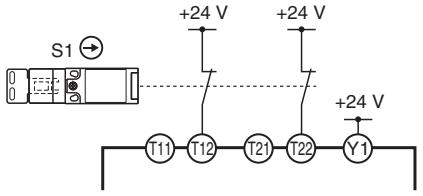
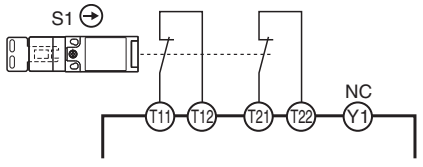
Cross fault detection input	Safety input to be monitored	Function summary
Terminal Y1	Terminals T11-T12 and T21-T22	Detects cross faults across T11-T12 and T21-T22
Terminal Y2	Terminals T61-T62 and T71-T72	Detect cross faults in T61-T62 and T71-T72

If a fault is detected, the following will occur.

1. The safety outputs and logical AND outputs will be locked out.
2. The LED error indicator will be lit.
3. The error output (auxiliary output) will turn ON.

For wiring, refer to the following description.

(1) Cross Fault between T11-T12 and T21-T22

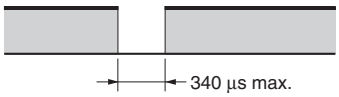
Cross fault detection	Wiring	
OFF	Corresponds to Safety Category 2	
	Corresponds to Safety Category 3	
ON	Corresponds to Safety Category 4	

2-5 Connecting Safety Sensors and the G9SX

(1) When connecting safety sensors to the G9SX, the Y1 terminal must be connected to 24 VDC.
The G9SX will detect a connection error, if the Y1 terminal is open.

(2) In many cases, safety sensor outputs include an OFF-shot pulse for self diagnosis.
The following condition of test pulse is applicable as safety inputs for the G9SX.

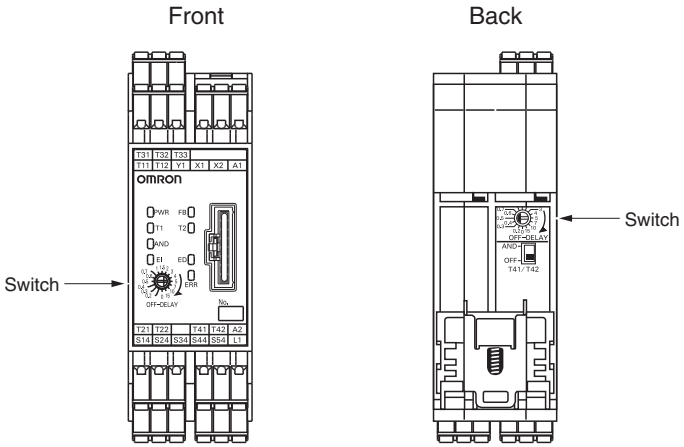
- OFF-shot pulse width of the sensor, during the ON-state: 340 μs max.



2-6 OFF-delay Time

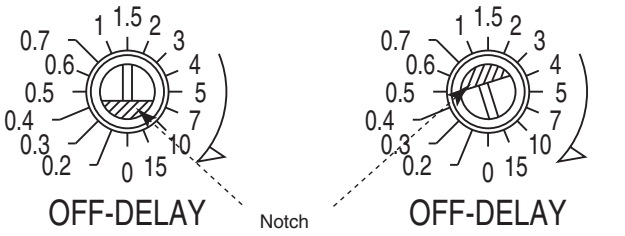
The safety output preset time is set using the OFF-delay time preset switch (1 each on the front and back of the Unit).

Note: 1. Normal operation will occur only if both switches are set to the same setting.
An error will occur if both switches are not identically set.
2. If the preset time is set to 0 seconds, the output function as an instantaneous safety output.



Refer to the following illustration for details on setting switch positions.

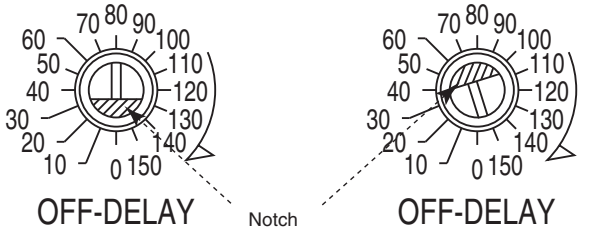
1. G9SX-AD322-T15



Example 1: 0-second OFF-delay setting

Example 2: 1-second OFF-delay setting

2. G9SX-AD322-T150

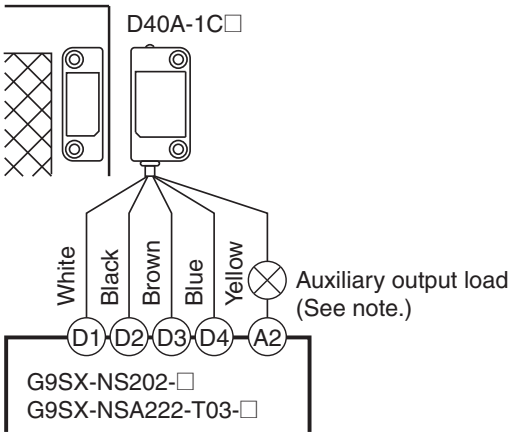


Example 1: 0-second OFF-delay setting

Example 2: 70-second OFF-delay setting

2-7 Non-contact Door Switch

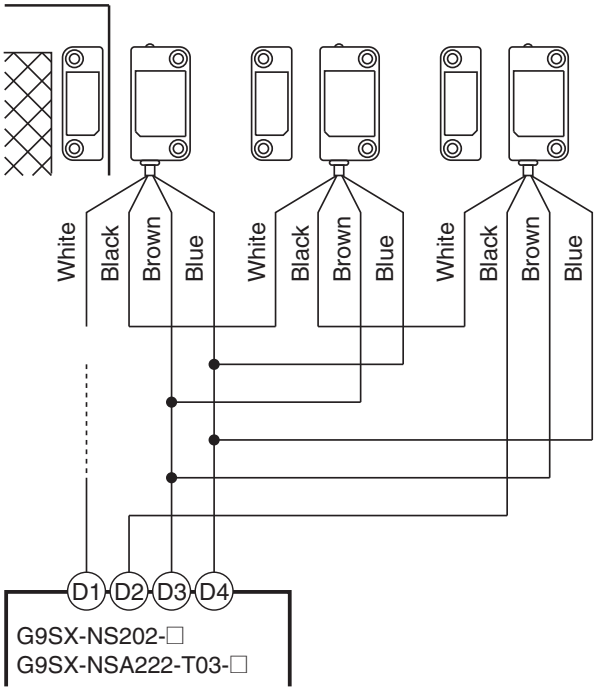
Example: Wiring a Single Switch



Note: The auxiliary output load current must be 10 mA max.

Example: Wiring Multiple Switches

Connect Up to 30 Non-contact Door Switches.



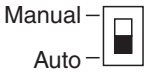
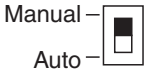
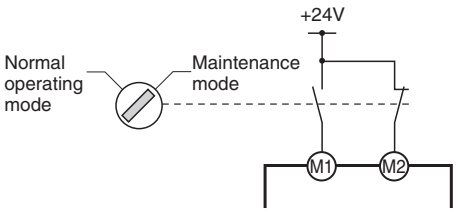
Wiring of Inputs and Outputs

Signal name	Wire color	Description of operation
Non-contact Door Switch power supply input	Brown	Supplies power to the D40A. Connect to the D3 and D4 terminals of the G9SX-NS□.
	Blue	
Non-contact Door Switch input	White	Inputs signals from the G9SX-NS□. The Non-contact Door Switch input must be ON as a required condition for the Non-contact Door Switch output to be ON.
Non-contact Door Switch output	Black	Turns ON and OFF according to actuator detection and the status of the Non-contact Door Switch input.
Auxiliary output	Yellow	Turns ON when actuator is detected.

2-8 Switching Mode

The switching mode is set by using the Switching Function setting switch on the bottom of the G9SX Unit. Set the switch to Auto for auto switching and Manual for manual switching.

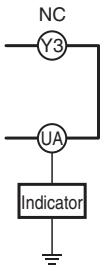
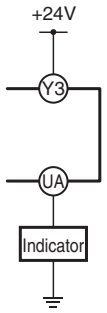
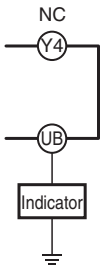
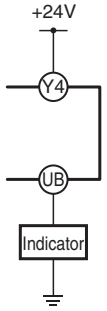
For manual switching, connect the mode selector as shown in the following table.

Switching Mode	Switching Function setting switch	Mode selector connection
Auto switching		
Manual switching		 M1 ON, M2 OFF: Normal operating mode M1 OFF, M2 ON: Maintenance mode

2-9 External Indicator Fault Diagnosis

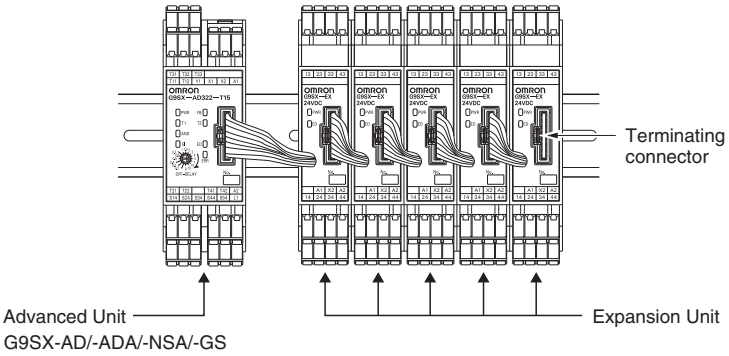
Diagnostic checks of external indicators connected to the G9SX-GS's external indicator outputs UA and UB can be switched with Y3 and Y4, respectively.

Note: 1. If there is no indicator connected to external indicator output UA, connect Y3 to 24 V. If there is no indicator connected to external indicator output UB, connect Y4 to 24 V. If they are not connected to 24 V, the G9SX-GS will detect an error.
2. Diagnostic checks cannot be made for LED indicators. Disable the diagnostic check if using LED indicators.

External indicator output	Diagnostic check enabled	Diagnostic check disabled
UA		
UB		

2-10 Connecting Expansion Units

- G9SX-EX/G9SX-EX-T Expansion Units can be connected to the G9SX-AD/-ADA Advanced Unit, G9SX-NSA Non-contact Door Switch Controller, or G9SX-GS Safety Guard Switching Unit to increase the number of safety outputs. (Expansion Units cannot be connected to the G9SX-BC or to the G9SX-NS Non-contact Door Switch Controller.)
- A maximum of five Expansion Units can be connected to one Advanced Unit. This may be a combination of G9SX-EX Instantaneous types and G9SX-EX-T OFF-delayed types.
- Remove the end connector from the Unit (G9SX-AD, G9SX-ADA, G9SX-NSA, or G9SX-GS) and insert the connector on the Connecting Cable from the first Expansion Unit. Place the end connector that was removed from the Unit on the last Expansion Unit (i.e., the rightmost Expansion Unit).
- When Expansion Units are connected to an Advanced Unit, make sure that power is supplied to every Expansion Unit. (Refer to the following diagram for actual Expansion Unit connection.)



2-11 Confirming Settings

Settings for the G9SX can be checked by the orange indicators for approx. 3 seconds after the power is turned ON. During this settings indication period, the ERR indicator will light, however the auxiliary error output will remain OFF.

G9SX-AD/-ADA/-BC/-NS/-NSA

Indicator	Item	Setting position	Indicator status	Setting mode	Setting status
T1	Cross fault detection mode	Y1 terminal	Lit	Detection mode	Y1 = open
			Not lit	Non-detection mode	Y1 = 24 VDC
FB	Reset mode	T33 or T32 terminal	Lit	Manual reset mode	T33 = 24 VDC
			Not lit	Auto reset mode	T32 = 24 VDC
AND (AND1, AND2)	Logical AND connection input mode (See note.)	Logical AND connection preset switch	Lit	Enable logical AND input	"AND"
			Not lit	Disable logical AND input	"OFF"

Note: Except for the G9SX-BC and G9SX-NS.

G9SX-GS

Indicator	Item	Setting position	Indicator status	Setting mode	Setting status
T1	Cross fault detection mode for safety input A	Y1 terminal	Lit	Enabled	Y1 = open
			Not lit	Disabled	Y1 = 24 VDC
T6	Cross fault detection mode for safety input B	Y2 terminal	Lit	Enabled	Y2 = open
			Not lit	Disabled	Y2 = 24 VDC
FB	Reset mode	T33 or T32 terminal	Lit	Manual reset mode	T33 = 24 VDC
			Not lit	Auto reset mode	T32 = 24 VDC
AND	Logical AND connection input mode	Logical AND connection preset switch	Lit	Enabled	"AND"
			Not lit	Disabled	"OFF"
UA, UB	Switching Function	Switching Function setting switch	Lit	Manual switching	"Manual"
			Not lit	Auto switching	"Auto"

Section 4

Ratings and Specifications

1. Ratings	**72**
1-1 Advanced Unit/Basic Unit	72
1-2 Non-contact Door Switch Controller	73
1-3 Safety Guard Switching Unit	74
1-4 Expansion Unit	75
2. Characteristics	**76**
2-1 Advanced Unit/Basic Unit	76
2-2 Non-contact Door Switch Controller	77
2-3 Safety Guard Switching Unit	78
2-4 Expansion Unit	79
3. Dimensions and Terminal arrangements	**80**
3-1 Advanced Unit	80
3-2 Basic Unit	80
3-3 Non-contact Door Switch Controller	81
3-4 Safety Guard Switching Unit	81
3-5 Expansion Unit	82

1. Ratings

1-1 Advanced Unit/Basic Unit

Power input

Item / Model	G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Rated supply voltage	24 VDC	
Operating voltage range	−15% to 10% of rated supply voltage	
Rated power consumption (See note.)	4 W max.	3 W max.

Note: Power consumption of loads not included.

Inputs

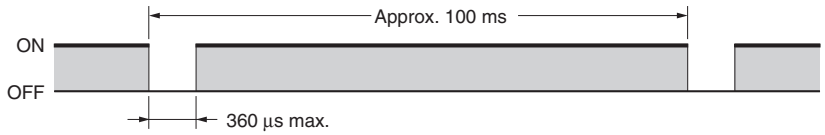
Item / Model	G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Safety input	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. 2.8 kΩ (See note.)	
Feedback/reset input		

Note: Provide a current equal to or higher than that of the minimum applicable load of the connected input control device.

Outputs

Item / Model	G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Instantaneous safety output (See note 1.) OFF-delayed safety output (See note 1.)	P channel MOS FET transistor output Load current: Using 2 outputs or less: 1 A DC max. (See note 2.) Using 3 outputs or more: 0.8 A DC max.	P channel MOS FET transistor output Load current: Using 1 output: 1 A DC max. (See note 2.) Using 2 outputs: 0.8 A DC max.
Auxiliary output	PNP transistor output Load current: 100 mA max.	

Note: 1. While safety outputs are in the ON state, the following signal sequence is output continuously for diagnosis. When using the safety outputs as input signals to control devices (i.e. Programmable Controllers), consider the OFF pulse shown below.



2. The following derating is required when Units are mounted side-by-side.
G9SX-AD322-□/G9SX-ADA222-□/G9SX-BC202-□: 0.4 A DC max. load current

1-2 Non-contact Door Switch Controller

Power input

Item / Model	G9SX-NS202-□	G9SX-NSA222-T03-□
Rated supply voltage	24 VDC	
Operating voltage range	−15% to 10% of rated supply voltage	
Rated power consumption (See note.)	3 W max.	4 W max.

Note: Power consumption of loads not included.

Inputs

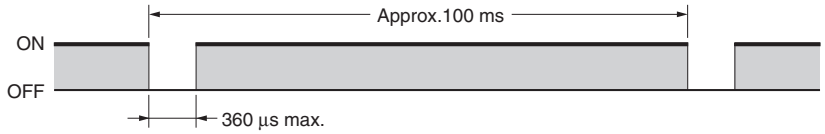
Item / Model	G9SX-NS202-□/G9SX-NSA222-T03-□
Safety input (See note 1.)	Operating voltage: 20.4 VDC to 26.4 VDC, internal impedance: approx. 2.8kΩ (See note 2.)
Feedback/reset input	

Note: 1. Only applies to the G9SX-NSA222-T03-□. Refers to input other than that from the Non-contact Door Switch.
2. Provide a current equal to or higher than that of the minimum applicable load of the connected input control device.

Outputs

Item / Model	G9SX-NS202-□/G9SX-NSA222-T03-□
Instantaneous safety output (See note 1.) OFF-delayed safety output (See note 1.)	P channel MOS FET transistor output Load current: 0.8 A DC max. (See note 2 and 3.)
Auxiliary output	PNP transistor output Load current: 100 mA max.

Note: 1. While safety outputs are in the ON state, the following signal sequence is output continuously for diagnosis.
When using the safety outputs as input signals to control devices (i.e. Programmable Controllers), consider the OFF pulse shown below.



2. The following derating is required when Units are mounted side-by-side.
G9SX-NS202-□/G9SX-NSA222-T03-□: 0.4 A DC max. load current
3. Apply the following rated load conditions for inductive loads.
IEC/EN 60947-5-1 DC13: 0.8 A
UL508 Pilot Duty: 0.5 A

1-3 Safety Guard Switching Unit

Power Input

Item / Model	G9SX-GS226-T15-□
Rated supply voltage	24 VDC
Operating voltage range	−15% to 10% of rated supply voltage
Rated power consumption (See note.)	5 W max.

Note: Power consumption of loads not included.

Inputs

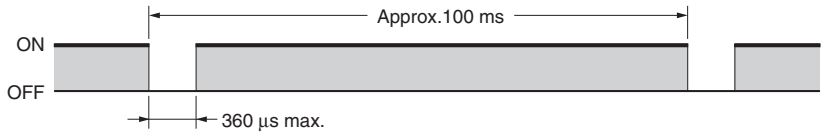
Item / Model	G9SX-GS226-T15-□
Safety inputs	Operating voltage: 20.4 VDC to 26.4 VDC, Internal impedance: Approx. 2.8 kΩ (See note.)
Mode selector input	
Feedback/reset input	

Note: Provide a current equal to or higher than that of the minimum applicable load of the connected input control device.

Outputs

Item / Model	G9SX-GS226-T15-□
Instantaneous safety outputs (See note 1.) OFF-delayed safety outputs (See note 1.)	P channel MOS FET transistor outputs Load current: 0.8 A DC max. (See note 2 and 3.)
Auxiliary outputs (for input, output, and error monitoring)	PNP transistor outputs Load current: 100 mA max.
External indicator outputs	P channel MOS FET transistor outputs Connectable indicators • Incandescent lamp: 24 VDC, 3 to 7 W • LED lamp: 10 to 300 mA DC

Note: 1. While safety outputs are in the ON state, the following signal sequence is output continuously for diagnosis. When using the safety outputs as input signals to control devices (i.e. Programmable Controllers), consider the OFF pulse shown below.



2. The following derating is required when Units are mounted side-by-side.
G9SX-GS226-T15-□: 0.4 A DC max. load current

3. Apply the following rated load conditions for inductive loads.
IEC/EN 60947-5-1 DC13: 0.8 A
UL508 Pilot Duty: 0.5 A

1-4 Expansion Unit

Power Input

Item / Model	G9SX-EX-□
Rated supply voltage	24 VDC
Operating voltage range	−15% to 10% of rated supply voltage
Rated power consumption (See note.)	2 W max.

Note: Power consumption of loads not included.

Outputs

Item / Model	G9SX-EX-□
Rated load	250 VAC, 3 A / 30 VDC, 3 A (resistive load)
Rated carry current	3 A
Maximum switching voltage	250 VAC, 125 VDC

2. Characteristics

2-1 Advanced Unit/Basic Unit

Item / Model		G9SX-AD322-□/ADA222-□	G9SX-BC202-□
Over-voltage category (IEC/EN 60664-1)		II	
Operating time (OFF to ON state) (See note 1.)		50 ms max. (Safety input: ON) (See note 2.) 100 ms max. (Logical AND connection input: ON) (See note 3.)	50 ms max. (Safety input: ON)
Response time (ON to OFF state) (See note 1.)		15 ms max.	
ON-state residual voltage		3.0 V max. (safety output, auxiliary output)	
OFF-state leakage current		0.1 mA max. (safety output, auxiliary output)	
Maximum wiring length of safety input and logical AND input		100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)	
Reset input time (Reset button pressing time)		100 ms min.	
Accuracy of OFF-delay time		Within ± 5% of the set value	---
Insulation resistance	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	20 MΩ min. (at 100 VDC)	---
	Between all terminals connected together and DIN rail		20 MΩ min. (at 100 VDC)
Dielectric strength	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	500 VAC for 1 min	---
	Between all terminals connected together and DIN rail		500 VAC for 1 min
Vibration resistance		Frequency: 10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)	
Shock resistance	Destruction	300 m/s²	
	Malfunction	100 m/s²	
Ambient temperature		−10 to 55°C (no icing or condensation)	
Ambient humidity		25% to 85%	
Terminal tightening torque (See note 4.)		0.5 N·m	
Weight		Approx. 200 g	Approx. 125 g

Note: 1. When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.

2. Represents the operating time when the safety input turns ON with all other conditions set.

3. Represents the operating time when the logical AND input turns ON with all other conditions set.

4. For the G9SX-□-RT (with screw terminals) only.

2-2 Non-contact Door Switch Controller

Item	Model	G9SX-NS202-□	G9SX-NSA222-T03-□
Over-voltage category (IEC/EN 60664-1)		II	
Operating time (OFF to ON state) (See note 1.)		100 ms max. (Logical AND connection input ON and Non-contact Door Switch input ON)	50 ms max. (Safety input: ON) (See note 2.) 100 ms max. (Logical AND connection input ON and Non-contact Door Switch input ON) (See note 3.)
Response time (ON to OFF state) (See note 1.)		15 ms max. (Logical AND connection input: OFF) 20 ms max. (Non-contact Door Switch input OFF) (See note 4.)	15 ms max. (Safety input OFF and logical AND connection input OFF) 20 ms max. (Non-contact Door Switch input: OFF) (See note 4.)
ON-state residual voltage		3.0 V max. (safety output, auxiliary output)	
OFF-state leakage current		0.1 mA max. (safety output, auxiliary output)	
Maximum wiring length of safety input, logical AND connection input, and Non-contact Door Switch input		100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)	
Reset input time (Reset button pressing time)		100 ms min.	
Accuracy of OFF-delay time		---	Within ±5% of the set value
Insulation resistance	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	20 MΩ min. (at 100 VDC)	
	Between all terminals connected together and DIN rail		
Dielectric strength	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	500 VAC for 1 min.	
	Between all terminals connected together and DIN rail		
Vibration resistance		10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)	
Shock resistance	Destruction	300 m/s²	
	Malfunction	100 m/s²	
Ambient operating temperature		−10 to 55°C (no icing or condensation)	
Ambient operating humidity		25% to 85%	
Terminal tightening torque (See note 5.)		0.5 N·m	
Weight		Approx. 125 g	Approx. 200 g

Note: 1. When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.

2. Represents the operating time when the safety input turns ON with all other conditions set.

3. Represents the operating time when the logical AND input and the Non-contact Door Switch input turn ON with all other conditions set.

4. The fault detection time for 24-V short-circuit faults on the non-contact door switch input is 35 ms max.
When calculating the safe distance for applications other than as door switches, use a fault detection time of 35 ms.

5. For the G9SX-□-RT (with screw terminals) only.

2-3 Safety Guard Switching Unit

Item	Model	G9SX-GS226-T15-□
Overvoltage category (IEC/EN 60664-1)		II
Operating time (OFF to ON state) (See note 1.)		50 ms max. (Safety input: ON) (See note 2.) 100 ms max. (Logical AND connection input: ON) (See note 3.)
Response time (ON to OFF state) (See note 1.)		15 ms max.
Allowable switching time for mode selector input (See notes 4 and 6.)		450 ms max.
Response time for switching operating modes (See notes 5 and 6.)		50 ms max.
ON-state residual voltage		3.0 V max. for safety outputs, auxiliary outputs, and external indicator outputs
OFF-state leakage current		0.1 mA max. for safety outputs and auxiliary outputs, 1 mA max. for external indicator outputs
Maximum wiring length of safety input and logical AND input		100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)
Reset input time (Reset button pressing time)		100 ms min.
Accuracy of OFF-delay time		Within ± 5% of the set value
Insulation resistance	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	20 MΩ min. (at 100 VDC)
	Between all terminals connected together and DIN rail	
Dielectric strength	Between logical AND connection terminals, and power supply input terminals and other input and output terminals connected together	500 VAC for 1 min
	Between all terminals connected together and DIN rail	
Vibration resistance		Frequency: 10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)
Shock resistance	Destruction	300 m/s²
	Malfunction	100 m/s²
Ambient operating temperature		−10 to 55°C (with no icing or condensation)
Ambient operating humidity		25% to 85%
Terminal tightening torque (See note 7.)		0.5 N·m
Weight		Approx. 240 g

Note: 1. When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.

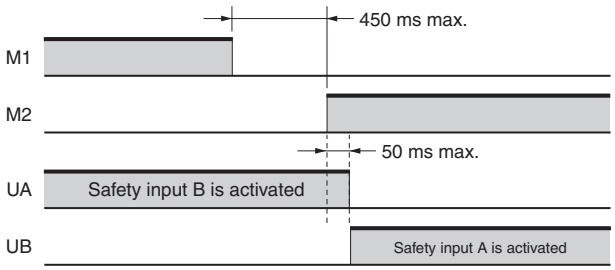
2. Represents the operating time when the safety input turns ON with all other conditions set.

3. Represents the operating time when the logical AND input turns ON with all other conditions set.

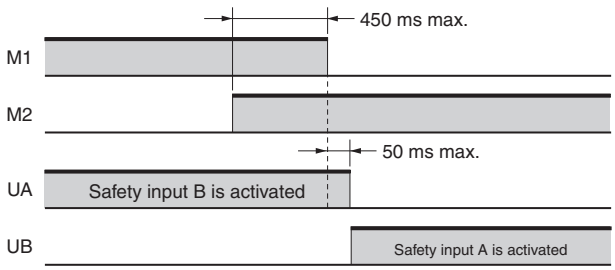
4. This is the allowable switching time for the operating mode selector. If switching takes more than 450 ms, the G9SX-GS□ will detect an error.

5. This is the time required for the safety input to actually switch to an activated condition after the mode selector input is switched.

<When M2 Is Turned ON after M1 Is Turned OFF>



<When M1 Is Turned OFF after M2 Is Turned ON>



6. Only when the G9SX-GS□ is used with manual switching.

7. For the G9SX-□-RT (with screw terminals) only.

2-4 Expansion Unit

Item / Model		G9SX-EX-□
Overvoltage category (IEC/EN 60664-1)		II (Safety relay outputs 13 to 43 and 14 to 44: III)
Operating time (OFF to ON state) (See note 1.)		30 ms max. (See note 2.)
Response time (ON to OFF state) (See note 1.)		10 ms max. (See note 2.)
ON-state residual voltage		3.0 V max. for safety outputs and auxiliary outputs
OFF-state leakage current		0.1 mA max. for safety outputs and auxiliary outputs
Maximum wiring length of safety input and logical AND input		100 m max. (External connection impedance: 100 Ω max. and 10 nF max.)
Reset input time (Reset button pressing time)		100 ms min.
Accuracy of OFF-delay time (See note 3.)		Within ± 5% of the set value
Insulation resistance	Between all terminals connected together and DIN rail	100 MΩ min. (at 500 VDC)
Dielectric strength	Between all terminals connected together and DIN rail	1,200 VAC for 1 min
	Between different poles of outputs	
	Between safety relay outputs connected together and other terminals connected together	2,200 VAC for 1 min
Vibration resistance		Frequency: 10 to 55 to 10 Hz, 0.375-mm single amplitude (0.75-mm double amplitude)
Shock resistance	Destruction	300 m/s²
	Malfunction	100 m/s²
Durability	Electrical	100,000 cycles min. (rated load, switching frequency: 1,800 cycles/hour)
	Mechanical	5,000,000 cycles min. (switching frequency: 7,200 cycles/hour)
Ambient operating temperature		−10 to 55°C (with no icing or condensation)
Ambient operating humidity		25% to 85%
Terminal tightening torque (See note 4.)		0.5 N·m
Weight		Approx. 165 g

Note: 1. When two or more Units are connected by logical AND, the operating time and response time are the sum total of the operating times and response times, respectively, of all the Units connected by logical AND.

2. This does not include the operating time or response time of Safety Guard Switching Units (G9SX-AD/-ADA/-NSA/-GS) that are connected.

3. This does not include the operating time or response time of internal relays in the G9SX-EX-□.

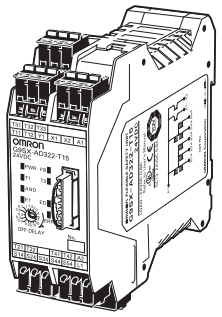
4. For the G9SX-□-RT (with screw terminals) only.

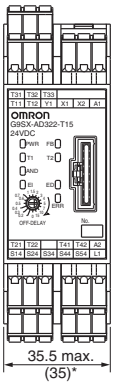
3. Dimensions and Terminal arrangements

Note: All units are in millimeters unless otherwise indicated.

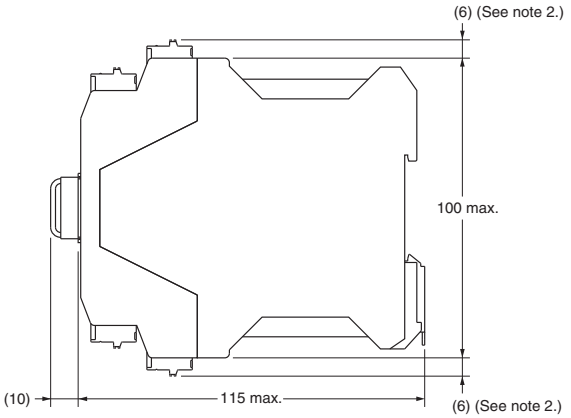
3-1 Advanced Unit

G9SX-AD322-□



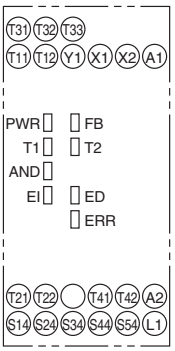


* Typical dimension

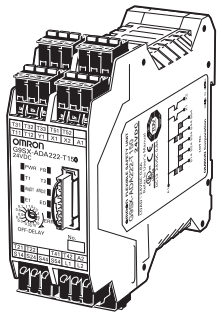


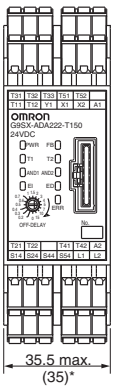
Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

Terminal arrangement

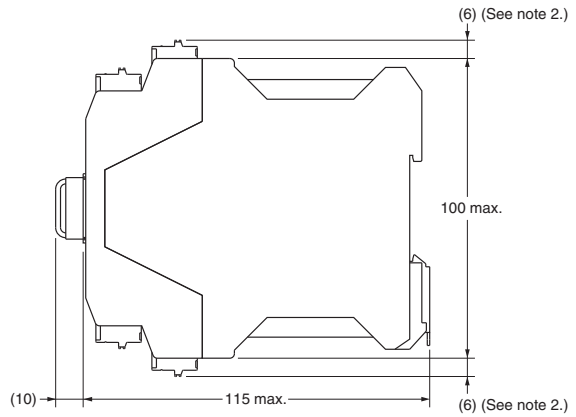


G9SX-ADA222-□



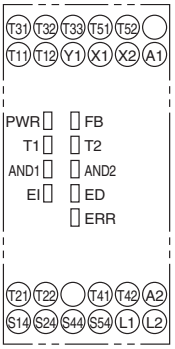


* Typical dimension



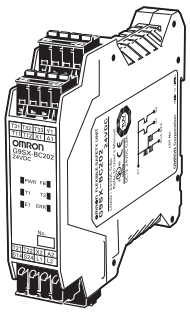
Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

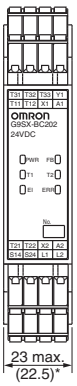
Terminal arrangement



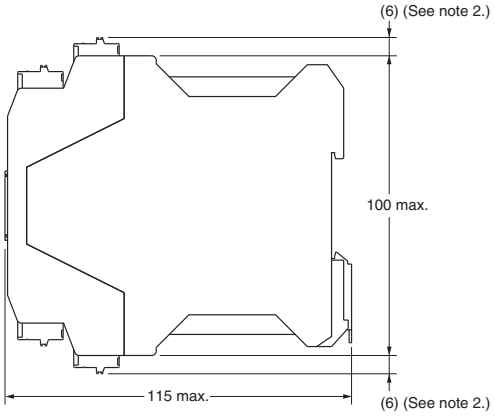
3-2 Basic Unit

G9SX-BC202-□



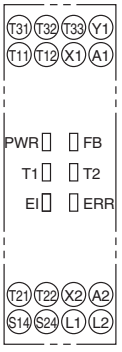


* Typical dimension



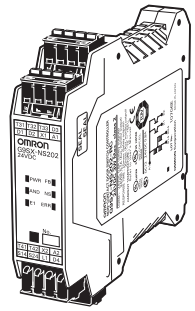
Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

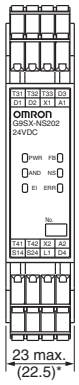
Terminal arrangement



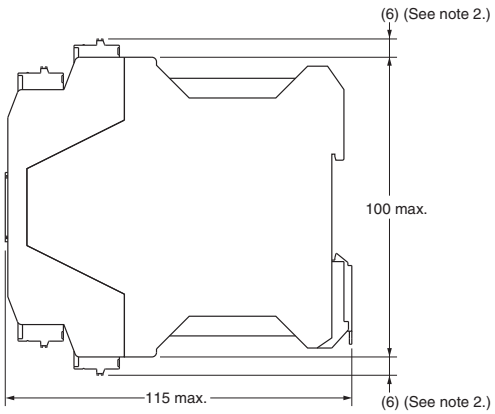
3-3 Non-contact Door Switch Controller

G9SX-NS202-□

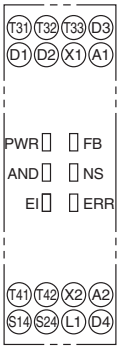




* Typical dimension

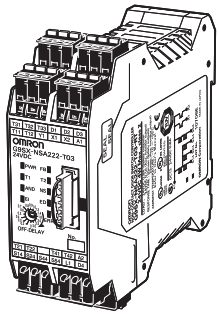


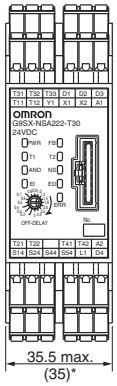
Terminal arrangement



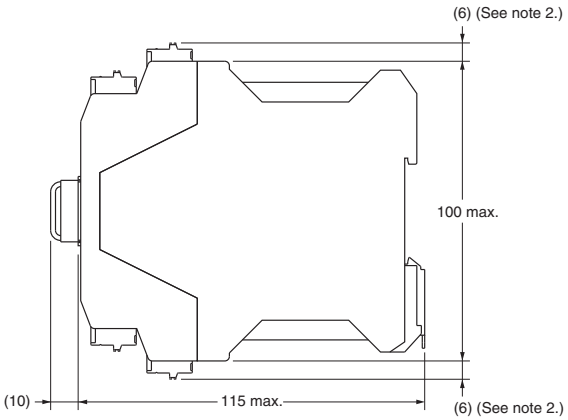
Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

G9SX-NSA222-T03-□

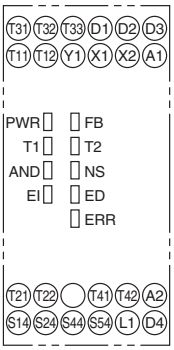




* Typical dimension



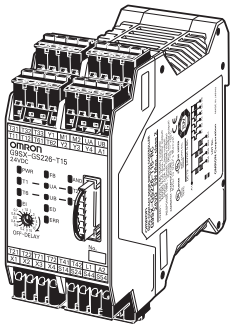
Terminal arrangement

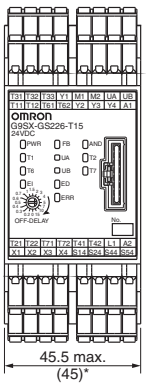


Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

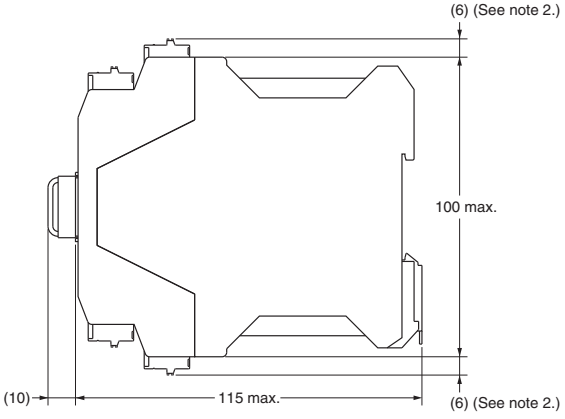
3-4 Safety Guard Switching Unit

G9SX-GS226-T15-□

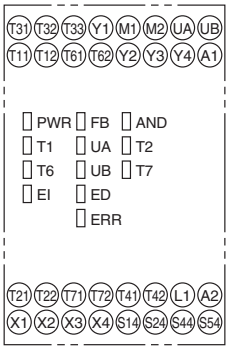




* Typical dimension



Terminal arrangement


T31 T32 T33 Y1 M1 M2 UA UB
T11 T12 T61 T62 Y2 Y3 Y4 A1
PWR FB AND
T1 UA T2
T6 UB T7
EI ED
ERR
T21 T22 T71 T72 T41 T42 L1 A2
X1 X2 X3 X4 S14 S24 S44 S54

Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

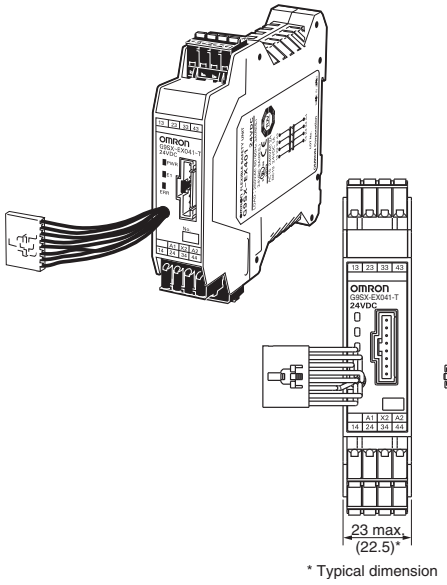
3-5 Expansion Unit

Expansion Unit

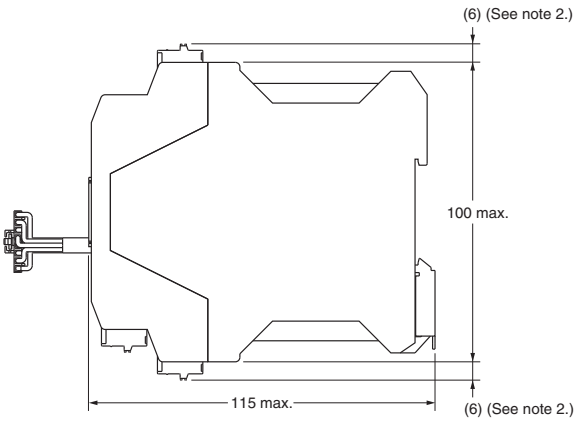
G9SX-EX401-□

Expansion Unit (OFF-delayed Model)

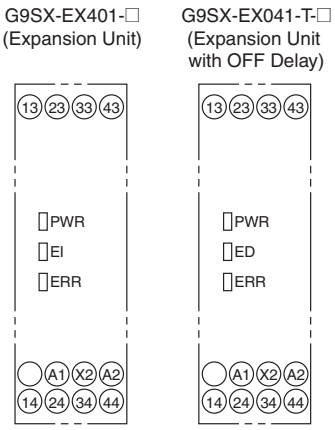
G9SX-EX041-T-□



* Typical dimension



Terminal arrangement



Note: 1. Above outline drawing is for -RC terminal type.
2. For -RC terminal type only.

Appendix

1. Troubleshooting	84
2. Logical AND Connections	91
3. Accessories and Related Products	93

1. Troubleshooting

■ Fault Detection

When the G9SX detects a fault, the ERR indicator and/or other indicators light up or blink to inform the user about the fault.

Check and take necessary measures referring to the following table, and then re-supply power to the G9SX.

■ Error Indications

G9SX-BC202-□/G9SX-AD322-□/G9SX-ADA222-□

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
☼ Blinks	---	Fault due to electro-magnetic disturbance or of internal circuits	(1) Affected by excessive electromagnetic disturbance.	(1) Check the disturbance level around the G9SX and the related system.	---
			(2) Failure of the G9SX internal circuit.	(2) Replace the G9SX.	---
● Lights	☼ T1 blinks	Fault involved with safety input 1	(1) Incorrect wiring of safety input 1. (For example, cross fault detection mode settings and safety input wiring do not match).	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input 1 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T11 and T12.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T11 and T12.	(4) Replace the G9SX.	---
	☼ T2 blinks	Fault involved with safety input 2	(1) Incorrect wiring of safety input 2. (For example, cross fault detection mode settings and safety input wiring do not match).	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input 2 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T21 and T22.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T21 and T22.	(4) Replace the G9SX.	---
	☼ FB blinks	Fault involved with feedback/reset inputs	(1) Incorrect feedback/reset input wiring.	(1) Check the wiring to T31, T32 and T33.	62
		Fault in Expansion Unit	(2) Connecting cable to Expansion Unit or terminating connector disconnected.	(2) Check the connecting cable to the Expansion Unit and the connection of the terminating connector.	69
		Abnormal supply voltage to Expansion Unit	(3) Voltage fluctuation caused by insufficient supply voltage current capacity.	(3) Change to a power supply with a greater current capacity.	---
			(4) Supply voltage outside the rated value.	(4) Connect to a supply voltage of 24 VDC -15% to +10%.	---
		Failure in internal circuit	(5) Failure in internal circuit for T31, T32 and T33.	(5) Replace the G9SX.	---
			(6) Expansion Unit relay contact or internal circuit failed.	(6) Replace the Expansion Unit.	---
	☼ EI blinks	Fault involved with instantaneous safety outputs	(1) Instantaneous safety outputs short circuited.	(1) Check the wiring to S14, S24 and S34.	---
			(2) Instantaneous safety outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S14, S24 and S34.	---
		Fault involved with logical AND connection outputs	(3) Logical AND connection outputs and 24 V, 0 V, or another I/O terminal short circuited.	(3) Check the wiring to L1 and L2.	---
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	76
		Failure in internal circuit	(5) Failure in internal circuit for S14, S24 and S34.	(5) Replace the G9SX.	---
			(6) Failure in internal circuit for L1 and L2.	(6) Replace the G9SX.	---

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
● Lights	☼ ED blinks	Fault involved with OFF-delayed safety outputs	(1) Safety OFF-delayed outputs short circuited.	(1) Check the wiring to S44 and S54.	---
			(2) Wiring to the OFF-delayed safety contact outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S44 and S54.	---
		Incorrect set values for OFF-delay time	(3) Settings of two OFF-delay time preset switches are not the same.	(3) Confirm the set values of the OFF-delay time preset switches on the front and back of the Unit.	65
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	76
		Failure in internal circuit	(5) Failure in internal circuit for S44 and S54.	(5) Replace the G9SX.	---
			(6) OFF-delay time preset switch failed.	(6) Replace the G9SX.	---
	☼ AND blinks (AND1, AND2)	Fault involved with logical AND connection input	(1) Logical AND connection input and 24 V, 0 V, or another I/O terminal short circuited.	(1) Check the wiring to T41 and T51.	---
			(2) Maximum cable length exceeded.	(2) Make sure that the wiring length for the T41, T42, T51 and T52 terminals is less than 100 m.	---
			(3) Maximum number of connected Units exceeded.	(3) Check the logical AND connection for the G9SX.	59
		Incorrect setting for logical AND connection setting switch	(4) The logical AND connection preset switch is set to OFF.	(4) When using a logical AND connection, set the logical AND connection preset switch to AND.	57
		Fault in internal circuit	(5) Failure in internal circuit for T41, T42, T51 and T52.	(5) Replace the G9SX.	---
			(6) The logical AND connection preset switch failed.	(6) Replace the G9SX.	---
	☼ All indicators except PWR blink	Supply voltage outside the rated value	(1) Supply voltage outside the rated value.	(1) Connect to a supply voltage of 24 VDC -15% to +10%.	---
			(2) Voltage fluctuation caused by insufficient supply voltage current capacity.	(2) Change to a power supply with a greater current capacity.	---

When indicators other than the ERR indicator blink, check and take necessary actions referring to the following table.

ERR indicator	Other indicator		Fault	Expected causes of the fault	Check points and measures to take	Page
○ Off	T1 / T2	☼ Blinks	Mismatch between input 1 and input 2	The input status between safety input 1 and safety input 2 is different due to a contact failure or short circuit of a safety input device or a wiring fault.	Check the wiring from safety input devices to the G9SX. Or check the input sequence of safety input devices. After removing the fault, turn both safety input 1 and 2 to the OFF state.	---

1. Troubleshooting

G9SX-NS202-□/G9SX-NSA222-□

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
☼ Blinks	---	Fault due to electro-magnetic disturbance or of internal circuits	(1) Affected by excessive electromagnetic disturbance.	(1) Check the disturbance level around the G9SX and the related system.	---
			(2) Failure of the G9SX internal circuit.	(2) Replace the G9SX.	---
● Lights	☼ T1 blinks	Fault involved with safety input 1	(1) Incorrect wiring of safety input 1. (For example, cross fault detection mode settings and safety input wiring do not match).	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input 1 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T11 and T12.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T11 and T12.	(4) Replace the G9SX.	---
	☼ T2 blinks	Fault involved with safety input 2	(1) Incorrect wiring of safety input 2. (For example, cross fault detection mode settings and safety input wiring do not match).	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input 2 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T21 and T22.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T21 and T22.	(4) Replace the G9SX.	---
	☼ NS blinks	Fault in Non-contact Door Switch input	(1) Wiring to the Non-contact Door Switch input and 24 V or another I/O terminal short circuited.	(1) Check the wiring to D1 and D2.	66
			(2) Incorrect wiring of Non-contact Door Switch inputs in series connection.	(2) Check the wiring to the D40A.	66
		Failure in internal circuit	(3) Non-contact Door Switch failed.	(3) Replace the D40A.	---
			(4) Failure in internal circuit for D1 and D2.	(4) Replace the G9SX.	---
	☼ FB blinks	Fault involved with feedback/reset inputs	(1) Incorrect feedback/reset input wiring.	(1) Check the wiring to T31, T32, and T33.	62
		Fault in Expansion Unit	(2) Connecting cable to Expansion Unit or terminating connector disconnected.	(2) Check the connecting cable to the Expansion Unit and the connection of the terminating connector.	69
		Abnormal supply voltage to Expansion Unit	(3) Voltage fluctuation caused by insufficient supply voltage current capacity.	(3) Change to a power supply with a greater current capacity.	---
			(4) Supply voltage outside the rated value.	(4) Connect to a supply voltage of 24 VDC -15% to +10%.	---
		Failure in internal circuit	(5) Failure in internal circuit for T31, T32 and T33.	(5) Replace the G9SX.	---
			(6) Expansion Unit relay contact or internal circuit failed.	(6) Replace the Expansion Unit.	---
	☼ EI blinks	Fault involved with instantaneous safety outputs	(1) Instantaneous safety outputs short circuited.	(1) Check the wiring to S14 and S24.	---
			(2) Instantaneous safety outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S14 and S24.	---
		Fault involved with logical AND connection outputs	(3) Logical AND connection outputs and 24 V, 0 V, or another I/O terminal short circuited.	(3) Check the wiring to L1.	---
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	77
		Failure in internal circuit	(5) Failure in internal circuit for S14 and S24.	(5) Replace the G9SX.	---
			(6) Failure in internal circuit for L1.	(6) Replace the G9SX.	---

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
● Lights	☼ ED blinks	Fault involved with OFF-delayed safety outputs	(1) Safety OFF-delayed outputs short circuited.	(1) Check the wiring to S44 and S54.	---
			(2) Wiring to the OFF-delayed safety contact outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S44 and S54.	---
		Incorrect set values for OFF-delay time	(3) Settings of two OFF-delay time preset switches are not the same.	(3) Confirm the set values of the OFF-delay time preset switches on the front and back of the Unit.	65
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	77
		Failure in internal circuit	(5) Failure in internal circuit for S44 and S54.	(5) Replace the G9SX.	---
			(6) OFF-delay time preset switch failed.	(6) Replace the G9SX.	---
	☼ AND blinks	Fault involved with logical AND connection input	(1) Logical AND connection input and 24 V, 0 V, or another I/O terminal short circuited.	(1) Check the wiring to T41.	---
			(2) Maximum cable length exceeded.	(2) Make sure that the wiring length for the T41 and T42 terminals is less than 100 m.	---
			(3) Maximum number of connected Units exceeded.	(3) Check the logical AND connection for the G9SX.	59
		Incorrect setting for logical AND connection setting switch	(4) The logical AND connection preset switch is set to OFF.	(4) When using a logical AND connection, set the logical AND connection preset switch to AND.	57
		Fault in internal circuit	(5) Failure in internal circuit for T41 and T42.	(5) Replace the G9SX.	---
			(6) The logical AND connection preset switch failed.	(6) Replace the G9SX.	---
	☼ All indicators except PWR blink	Supply voltage outside the rated value	(1) Supply voltage outside the rated value.	(1) Connect to a supply voltage of 24 VDC -15% to +10%.	---
			(2) Voltage fluctuation caused by insufficient supply voltage current capacity.	(2) Change to a power supply with a greater current capacity.	---

When indicators other than the ERR indicator blink, check and take necessary actions referring to the following table.

ERR indicator	Other indicator		Fault	Expected causes of the fault	Check points and measures to take	Page
○ Off	T1 / T2	☼ Blinks	Mismatch between input 1 and input 2	The input status between safety input 1 and safety input 2 is different due to a contact failure or short circuit of a safety input device or a wiring fault.	Check the wiring from safety input devices to the G9SX. Or check the input sequence of safety input devices. After removing the fault, turn both safety input 1 and 2 to the OFF state.	---

1. Troubleshooting

G9SX-GS226-□

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
☼ Blinks	---	Fault due to electro-magnetic disturbance or of internal circuits	(1) Affected by excessive electromagnetic disturbance.	(1) Check the disturbance level around the G9SX and the related system.	---
			(2) Failure of the G9SX internal circuit.	(2) Replace the G9SX.	---
● Lights	☼ T1 blinks	Fault involved with safety input A, channel 1	(1) Incorrect wiring of safety input A channel 1. (For example, cross fault detection mode settings and safety input wiring do not match.)	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input A channel 1 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T11 and T12.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T11 and T12.	(4) Replace the G9SX.	---
	☼ T2 blinks	Fault involved with safety input A, channel 2	(1) Incorrect wiring of safety input A channel 2. (For example, cross fault detection mode settings and safety input wiring do not match.)	(1) Check the wiring to T11, T12, T21, T22 and Y1.	63
			(2) Wiring to safety input A channel 2 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T21 and T22.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T11, T12, T21 and T22.	63
			(4) Failure in internal circuit for T21 and T22.	(4) Replace the G9SX.	---
	☼ T6 blinks	Fault involved with safety input B, channel 1	(1) Incorrect wiring of safety input B channel 1. (For example, cross fault detection mode settings and safety input wiring do not match.)	(1) Check the wiring to T61, T62, T71, T72 and Y2.	63
			(2) Wiring to safety input B channel 1 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T61 and T62.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T61, T62, T71 and T72.	63
			(4) Failure in internal circuit for T61 and T62.	(4) Replace the G9SX.	---
	☼ T7 blinks	Fault involved with safety input B, channel 1	(1) Incorrect wiring of safety input B channel 2. (For example, cross fault detection mode settings and safety input wiring do not match.)	(1) Check the wiring to T61, T62, T71, T72 and Y2.	63
			(2) Wiring to safety input B channel 2 and 24 V or another I/O terminal short circuited.	(2) Check the wiring to T71 and T72.	---
			(3) Short circuit between safety inputs (when cross fault detection mode is ON).	(3) Check the wiring to T61, T16, T71 and T72.	63
			(4) Failure in internal circuit for T71 and T72.	(4) Replace the G9SX.	---
	☼ FB blinks	Fault involved with feedback/reset inputs	(1) Incorrect feedback/reset input wiring.	(1) Check the wiring to T31, T32, and T33.	62
		Fault in Expansion Unit	(2) Connecting cable to Expansion Unit or terminating connector disconnected.	(2) Check the connecting cable to the Expansion Unit and the connection of the terminating connector.	69
		Abnormal supply voltage to Expansion Unit	(3) Voltage fluctuation caused by insufficient supply voltage current capacity.	(3) Change to a power supply with a greater current capacity.	---
			(4) Supply voltage outside the rated value.	(4) Connect to a supply voltage of 24 VDC -15% to +10%.	---
		Failure in internal circuit	(5) Failure in internal circuit for T31, T32 and T33.	(5) Replace the G9SX.	---
			(6) Expansion Unit relay contact or internal circuit failed.	(6) Replace the Expansion Unit.	---

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
● Lights	☼ EI blinks	Fault involved with instantaneous safety outputs	(1) Instantaneous safety outputs short circuited.	(1) Check the wiring to S14 and S24.	---
			(2) Instantaneous safety outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S14 and S24.	---
		Fault involved with logical AND connection outputs	(3) Logical AND connection outputs and 24 V, 0 V, or another I/O terminal short circuited.	(3) Check the wiring to L1.	---
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	78
		Failure in internal circuit	(5) Failure in internal circuit for S14 and S24.	(5) Replace the G9SX.	---
			(6) Failure in internal circuit for L1.	(6) Replace the G9SX.	---
	☼ ED blinks	Fault involved with OFF-delayed safety outputs	(1) Safety OFF-delayed outputs short circuited.	(1) Check the wiring to S44 and S54.	---
			(2) Wiring to the OFF-delayed safety contact outputs and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to S44 and S54.	---
		Incorrect set values for OFF-delay time	(3) Settings of two OFF-delay time preset switches are not the same.	(3) Confirm the set values of the OFF-delay time preset switches on the front and back of the Unit.	65
		Abnormal ambient temperature	(4) The environment exceeds the permissible ambient operating temperature.	(4) Check the ambient temperature and spacing around the G9SX.	78
		Failure in internal circuit	(5) Failure in internal circuit for S44 and S54.	(5) Replace the G9SX.	---
			(6) OFF-delay time preset switch failed.	(6) Replace the G9SX.	---
	☼ AND blinks	Fault involved with logical AND connection input	(1) Logical AND connection input and 24 V, 0 V, or another I/O terminal short circuited.	(1) Check the wiring to T41.	---
			(2) Maximum cable length exceeded.	(2) Make sure that the wiring length for the T41 and T42 terminals is less than 100 m.	---
			(3) Maximum number of connected Units exceeded.	(3) Check the logical AND connection for the G9SX.	59
		Incorrect setting for logical AND connection setting switch	(4) The logical AND connection preset switch is set to OFF.	(4) When using a logical AND connection, set the logical AND connection preset switch to AND.	57
		Fault in internal circuit	(5) Failure in internal circuit for T41 and T42.	(5) Replace the G9SX.	---
			(6) The logical AND connection preset switch failed.	(6) Replace the G9SX.	---
	☼ UA blinks	Fault in external indicator output	(1) Wiring to the external indicator output and 24 V, 0 V, or another I/O terminal short circuited.	(1) Check the wiring to UA.	---
			(2) External indicator output disconnected. (external indicator not connected)	(2) Check the wiring to UA.	68
		Failure of the external indicator	(3) External indicator failed.	(3) Replace the connected external indicator.	---
		Fault in the external indicator diagnosis switching input	(4) Wiring for external indicator diagnosis switching input and 24 V disconnected. (when external indicator was not connected)	(4) Check the wiring to Y3.	68
		Failure in internal circuit	(5) Failure in internal circuit for UA.	(5) Replace the G9SX.	---
			(6) Failure in internal circuit for Y3.	(6) Replace the G9SX.	---

ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
● Lights	☼ UB blinks	Fault in external indicator output	(1) Wiring to the external indicator output and 24 V, 0 V, or another I/O terminal short circuited.	(1) Check the wiring to UB.	---
			(2) External indicator output disconnected. (external indicator not connected)	(2) Check the wiring to UB.	68
		Failure of the external indicator	(3) External indicator failed.	(3) Replace the external indicator.	---
		Fault in the external indicator diagnosis switching input	(4) Wiring for external indicator diagnosis switching input and 24 V disconnected. (when external indicator was not connected)	(4) Check the wiring to Y4.	68
		Failure in internal circuit	(5) Failure in internal circuit for UB.	(5) Replace the G9SX.	---
			(6) Failure in internal circuit for Y4.	(6) Replace the G9SX.	---
	☼ UA and UB alternately blink	Fault involved with the Switching Function	(1) Incorrect setting of the Switching Function setting switch or incorrect wiring to the mode selector input.	(1) Check the wiring to the M1 and M2, and the setting of the Switching Function setting switch.	67
			(2) Wiring to the mode selector input and 24 V, 0 V, or another I/O terminal short circuited.	(2) Check the wiring to M1 and M2.	67
		Mode selector error	(3) Incorrect mode selector input switching time.	(3) Check the mode selector input switching time.	78
			(4) Mode selector failed.	(4) Replace mode switch.	---
		Failure in internal circuit	(5) Internal circuit of the mode selector input failed.	(5) Replace the G9SX.	---
	☼ All indicators except PWR blink	Supply voltage outside the rated value	(1) Supply voltage outside the rated value.	(1) Connect to a supply voltage of 24 VDC -15% to +10%.	---
			(2) Voltage fluctuation caused by insufficient supply voltage current capacity.	(2) Change to a power supply with a greater current capacity.	---

When indicators other than the ERR indicator blink, check and take necessary actions referring to the following table.

ERR indicator	Other indicator		Fault	Expected causes of the fault	Check points and measures to take	Page
○ Off	T1	☼ Blinks	Safety input A mismatch	The input status between safety input A channel 1 and safety input A channel 2 is different due to contact failure or a short circuit of safety input device or a wiring fault.	Check the wiring from safety input devices to the G9SX-GS□. Or check the input sequence of safety input devices. After removing the fault, turn both safety input A channels 1 and 2 to the OFF state.	---
	T2					
	T6		Safety input B mismatch	The input status between safety input B channel 1 and safety input B channel 2 is different due to contact failure or a short circuit of safety input device or a wiring fault.	Check the wiring from safety input devices to the G9SX-GS□. Or check the input sequence of safety input devices. After removing the fault, turn both safety input B channels 1 and 2 to the OFF state.	---
	T7					

G9SX-EX401-□/G9SX-EX041-T-□

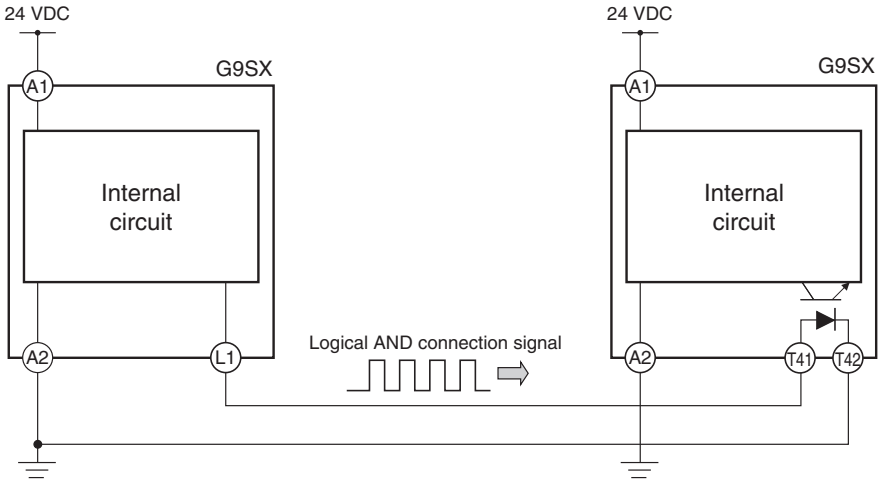
ERR indicator	Other indicator	Fault	Expected causes of the fault	Check points and measures to take	Page
● Lights	---	Failure of the Expansion Unit	Internal safety relay contact is welded.	Replace the G9SX-EX□.	---
			Internal circuit failed.	Replace the G9SX-EX□.	---

2. Logical AND Connections

The logical AND connection is used to build logic between multiple safety inputs and safety outputs. This technology is unique to the G9SX Series.

■ Logical AND Connection Signals

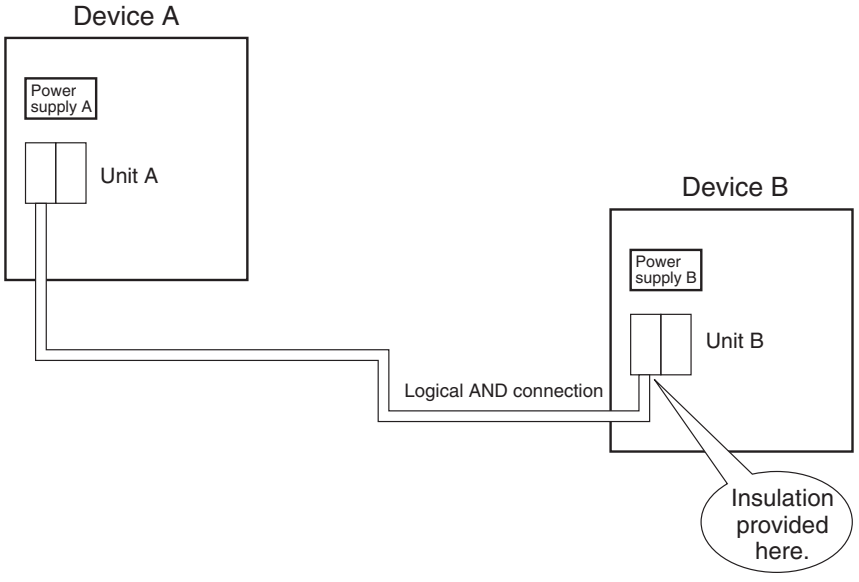
Pulse signals are used in the G9SX logical AND connection and dynamic processing is used to monitor the signals. Information on safety between Units is passed by these pulse signals, which are also used to detect faults in the connection and short circuits.



For this reason, up to safety category 4 can be achieved without redundant logical AND connection signal lines.

■ Insulation

The logical AND connection input section of the G9SX is insulated. Therefore, even when the G9SX logical AND connection cable is configured across multiple devices, it is not necessary to use a shared power source.



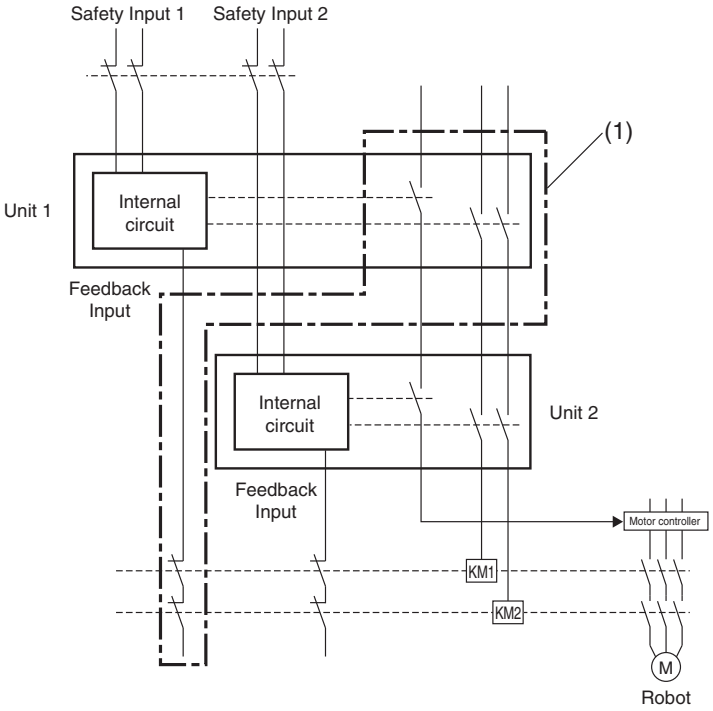
2. Logical AND Connections

■ Simplifying Safety Circuits

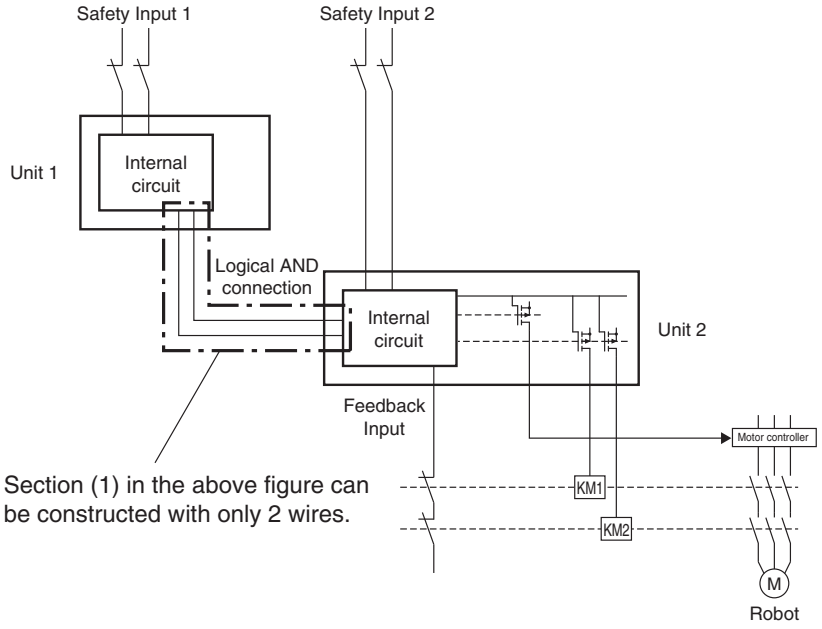
Safety circuits were traditionally built by combining relay contacts, but now the logical AND connections of the G9SX simplify building safety circuits.

A safety system will be described in which the power is turned ON when safety input 1 and safety input 2 are simultaneously input.

Previous Circuit with Relay Units

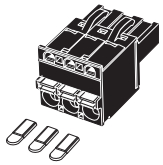


Safety Circuit with G9SX



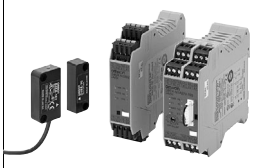
3. Accessories and Related Products

Accessories: Terminal Blocks

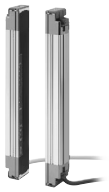
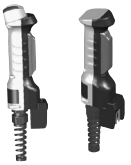
Appearance (See note 1.)	Specifications	Applicable Units	Model	Remarks
	Terminal Block with screw terminals (3-pin)	G9SX-AD-□-RT G9SX-ADA-□-RT G9SX-NSA-□-RT	Y9S-03T1B-02A	Set including two terminal blocks (black) with screw terminals and six code marks to prevent incorrect insertion.
	Terminal Block with screw terminals (4-pin)	G9SX-BC-□-RT G9SX-EX-□-RT G9SX-NS-□-RT G9SX-GS-□-RT	Y9S-04T1B-02A	Set including two terminal blocks (black) with screw terminals and six code marks to prevent incorrect insertion.
	Terminal Block with Spring-cage Terminals (3-pin)	G9SX-AD-□-RC G9SX-ADA-□-RC G9SX-NSA-□-RC	Y9S-03C1B-02A	Set including two terminal blocks (black) with spring-cage terminals and six code marks to prevent incorrect insertion.
	Terminal Block with Spring-cage Terminals (4-pin)	G9SX-BC-□-RC G9SX-EX-□-RC G9SX-NS-□-RC G9SX-GS-□-RC	Y9S-04C1B-02A	Set including two terminal blocks (black) with spring-cage terminals and six code marks to prevent incorrect insertion.

Note: 1. The illustrations show 3-pin models.
2. The G9SX comes with the terminal blocks attached. The accessories shown here can be ordered as replacements.

Related Products

Name	Model	Certified Body	Appearance	Features	Safety Category
Compact Safety Door Switch	D4NS			• Lineup includes models with 3 contacts (DPST-NC + SPST-NO and TPST-NC models) in addition to the previous DPST-NC + SPST-NO and DPST-NC models. • Models with M12 connectors are available to save labor and simplify replacement work. • Standard-feature gold-clad contacts provide high contact reliability. Can be used with both standard loads and microloads.	4
Compact Guard Lock Safety Door Switch	D4NL			• Built-in switches with four- or five-terminal contact construction are available. • Key holding force of 1,300 N minimum. • Can be used for either standard loads or microloads. • Lineup includes models with a conduit size of M20. • IP67 degree of protection.	4
Compact Safety Limit Switch	D4N			• Lineup includes models with 3 contacts (DPST-NC + SPST-NO and TPST-NC models) in addition to the previous DPST-NC + SPST-NO and DPST-NC models. • Models with M12 connectors are available to save labor and simplify replacement work. • Standard-feature gold-clad contacts provide high contact reliability. Can be used with both standard loads and microloads.	4
Compact Non-contact Door Switch/ Flexible Safety Unit	D40A/ G9SX-NS			• Stable operation reduces Controller errors caused by unstable doors. • Connect up to 30 Non-contact Door Switches with LED indicators to one Controller. • Reversible switch provides flexibility in installation. • Two-color LED indicator enables easier maintenance by providing identification of door status and cable disconnections. • Both Non-contact Door Switches and conventional Key-type Safety-door Switches can be input to one Controller, saving space.	3 (EN954-1) SIL3 (IEC/EN 61508)

3. Accessories and Related Products

Name	Model	Certified Body	Appearance	Features	Safety Category
Safety Light Curtain	F3SJ Ver.2			• Conforms to EN and IEC standards and incorporates the highest level of safety design. • Can be front-mounted, top-mounted, or back-mounted in series. • Finger, hand, or hand to body protection. • Sensing width of 245 to 2,500 mm.	4
Emergency Stop Switch	A165E			• Same length as the 16-dia. Short-body A3B Switch and allows mounting or dismounting of the Switch Unit. • Operational Unit design remains the same as previous models. • Large terminals for easy wiring. • Switch Unit can be easily mounted or dismounted using a special tool.	4
Emergency Stop Switch	A22E			• Easy mounting or dismounting of the Switch Unit from the Operational Unit using a lever (provided). • Not only round or forked crimp terminals, but also solid wires can be connected to the Switch. • Safety lock mechanism provided for the first time for 22-dia. models. • Applicable to 22.3-dia. or 25-dia. panel cutouts. IP65 degree of protection. (However, also use A22Z-R25 for 25-dia. cutout) • Employs a three-tier terminal block (for lighted model) for easy wiring in narrow spaces.	4
Enabling Grip Switch	A4EG	Scheduled for release in autumn of 2007.		• Sure click feel to ensure operation. • Easy configuration of safety circuits when combined with the G9SX-GS.	4
Key-type Selector Switch	A22K			• For changing modes when using the manual switching function of the G9SX-GS. • Direct opening mechanism (NC contacts only).	---

Precautions

Safety Precautions

⚠ WARNING

<Precautions for All G9SX Models>

Serious injury may possibly occur due to breakdown of safety outputs.
Do not connect loads beyond the rated value to the safety outputs.

Serious injury may possibly occur due to loss of required safety functions.
Wire G9SX properly so that supply voltages or voltages for loads do NOT touch the safety inputs accidentally or unintentionally.

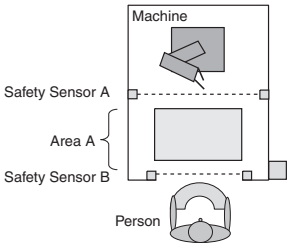
Serious injury may possibly occur due to damages of safety inputs.
Apply protection circuitry against back electromotive force in case connecting inductive loads to safety outputs.

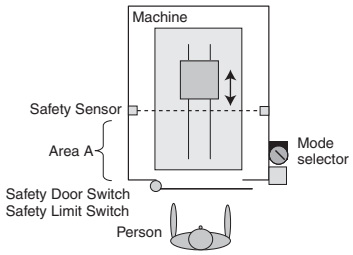
Serious injury may possibly occur due to loss of safety functions. Use devices appropriate for the application and the condition where G9SX is used.

Control Devices	Requirements
Emergency Stop Switches	Use approved devices with Direct Opening Mechanism complying with IEC/EN 60947-5-1. Do not connect an Emergency Stop Switch to the G9SX-GS□.
Door interlocking switches or limit switches.	Use approved devices with Direct Opening Mechanism complying with IEC/EN 60947-5-1 and capable of switching micro loads of 24VDC, 5mA.
Safety Sensors	Use approved devices complying with the relevant product standards, regulations and rules in the country where it is used. Consult a certification body to assess that the entire system satisfies the required safety category level.
Relays with forcibly guided contacts	Use approved devices with forcibly guided contacts complying with EN 50205. For feedback purpose use devices with contacts capable of switching micro loads of 24VDC, 5mA.
Contactors	Use contactors with forcibly guided mechanism to input the signal to Feedback/Reset input of G9SX through the NC contact of the contactor. For feedback purpose use devices with contacts capable of switching micro loads of 24VDC, 5mA. Failure to open contacts of a contactor cannot be detected by monitoring its auxiliary NC contact without forcibly guided mechanism.
Other devices	Evaluate whether devices used are appropriate to satisfy the requirements of safety category level.

<G9SX-GS□>

Serious injury may possibly occur due to loss of safety functions. Construct an appropriate safety system as shown in the following table.

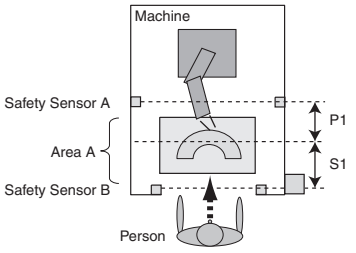
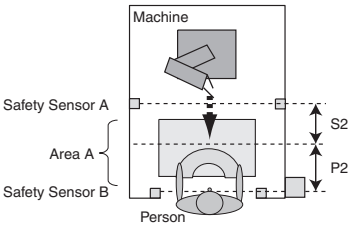
Switching function	Auto switching
Safety system configuration example	
Safety precautions	(1) Select Safety Sensors that satisfy the following condition: 1. Diameter of the smallest detectable object < Diameter of the object to be detected. (2) Install the Safety Sensors so that they satisfy the following conditions: 1. Use Safety Sensor A to detect the entry of the machine into area A, and Safety Sensor B to detect the entry of a person into area A. 2. Make sure that the machine can reach area A only by passing through Safety Sensor A, and that a person can reach area A only by passing through Safety Sensor B. (3) Provide a protective structure to prevent a person from passing completely through Safety Sensor B and stepping into area A. If this is not possible, install a sensor that will detect the presence of a person inside area A and prevent the machine from being restarted while the person is inside area A. (4) Provide a sufficient safety distance (S1) considering the entry speed of a person and a sufficient safety distance (S2) considering the entry speed of the machine. For details, refer to *Safety Distance* on page 97.

Switching function	Manual switching
Safety system configuration example	
Safety precautions	(1) Select Safety Sensors that satisfy the following condition: 1. Diameter of the smallest detectable object < Diameter of the object to be detected. (2) Install the Safety Sensors so that they satisfy the following conditions: 1. Use the Safety Sensor to detect the entry of the machine into area A. 2. Make sure that the machine can reach area A only by passing through the Safety Sensor. (3) Provide a protective structure to prevent a person from stepping into area A when the door is opened. If this is not possible, install a sensor that will detect the presence of a person inside area A and prevent the machine from being restarted while the person is inside area A. (4) Provide a sufficient safety distance (S2) considering the entry speed of the machine. For details, refer to *Safety Distance* on page 97. (5) Position the mode selector in a location where it cannot be operated from inside area A.

Safety Distance

The safety distance is the minimum distance that must be provided between the safety input device and a machine's hazardous part to stop the hazardous part before a person or object reaches it. The safety distance varies according to the standards of each country and the specifications of each machine. In addition, the calculation of the safety distance differs if the direction of approach is not perpendicular to the detection zone of the safety input device. Always refer to the relevant standards.

Safety Distance Concepts

When a person approaches a hazard (machine)	 • S1: Safety distance 1 • P1: The closest that a machine can come to a person while operating (the boundary of the machine's operating area)
When a hazard (machine) approaches a person	 • S2: Safety distance 2 • P2: The closest that a part of a person can come to a machine.

Safety Distance Calculation Examples (Reference)

Calculating the safety distance specified by international standard ISO 13855-2002 (European standard EN 999-1999)	If a person approaches the detection zone perpendicularly, calculate the safety distance as shown below. $S1 = K1 \times T + C$ $S2 = K2 \times T + C$ S1: Safety distance 1 S2: Safety distance 2 K1: Approach speed of a person to the detection zone (area A) K2: Maximum approach speed of a machine to the detection zone (area A) T: Total response time of the machine and G9SX system C: Additional distance calculated by the detection capability (the diameter of the smallest detectable object) of the Safety Sensor.
Calculating the safety distance specified by American standard ANSI B11.19	If a person approaches the detection zone perpendicularly, calculate the safety distance as shown below. $S1 = K1 \times (Ts + Tc + Tr + Tbm) + Dpf$ $S2 = K2 \times (Ts + Tc + Tr + Tbm) + Dpf$ S1: Safety distance 1 S2: Safety distance 2 K1: Approach speed of a person to the detection zone (area A) K2: Maximum approach speed of a machine to the detection zone (area A) Ts: Machine's stop time (s) Tr: Response time of the G9SX system from ON to OFF (s) Tc: Machine control circuit's maximum response time required to activate its brake (s) Tbm: Additional time (s) Dpf: Additional distance

(1) To determine the approach speed K1, consider all factors, including the operator's physical abilities.
(2) To determine the maximum approach speed K2, consult with a notified body or other authoritative institutes.
(3) The response time of a machine is the time from when the machine receives a stop signal to the time when the machine's hazardous part stops. Measure the response time on the actual system. Also, periodically check that the machine's response time has not changed.
(4) For information on the response time of the G9SX system, refer to item 10 of *Precautions for Correct Use* on page 98.

■ Precautions for Safe Use

<Precautions for All G9SX Models>

(1) Use G9SX within an enclosure with IP54 protection or higher of IEC/EN60529.
(2) Incorrect wiring may lead to loss of safety function. Wire conductors correctly and verify the operation of G9SX before commissioning the system in which G9SX is incorporated.
(3) Do not apply DC voltages exceeding the rated voltages, or any AC voltages to the G9SX power supply input.
(4) Use DC supply satisfying requirements below to prevent electric shock.
- DC power supply with double or reinforced insulation, for example, according to IEC/EN60950 or EN50178 or a transformer according to IEC/EN61558.
- DC supply satisfies the requirement for class 2 circuits or limited voltage/current circuit stated in UL 508.

(5) Apply properly specified voltages to G9SX inputs. Applying inappropriate voltages cause G9SX to fail to perform its specified function, which leads to the loss of safety functions or damages to G9SX.
(6) Auxiliary error outputs and auxiliary monitoring outputs are NOT safety outputs. Do not use auxiliary outputs as any safety output.
Such incorrect use causes loss of safety function of G9SX and its relevant system.
Also Logical AND connection outputs can only be used for logical AND connections between G9SXs.
(7) After installation of G9SX, qualified personnel should confirm the installation, and should conduct test operations and maintenance.
The qualified personnel should be qualified and authorized to secure the safety on each phases of design, installation, running, maintenance and disposal of system.
(8) A person in charge, who is familiar to the machine in which G9SX is to be installed, should conduct and verify the installation.
(9) Perform daily and 6-month inspections on the G9SX. Otherwise, the system may fail to work properly, resulting in serious injury.
(10) Do not dismantle, repair, or modify G9SX. It may lead to loss of its safety functions.
(11) Use only appropriate components or devices complying with relevant safety standards corresponding to the required level of safety categories.
Conformity to requirements of safety category is determined as an entire system.
It is recommended to consult a certification body regarding assessment of conformity to the required safety level.
(12) OMRON shall not be responsible for conformity with any safety standards regarding to customer's entire system.
(13) Disconnect G9SX from power supply when wiring, to prevent electric shock or unexpected operation.
Doing so may lead to the loss of its safety functions.
(14) Be cautious not to have your fingers caught when attaching terminal sockets to the plugs on G9SX.
(15) Do not use in combustible gases or explosive gases.

<G9SX-GS□>

(1) Be sure to correctly connect safety input devices to safety input A and safety input B to ensure proper operation of the safety functions.
(2) When setting the Switching Function, be sure to consider safety control requirements, safety level and safety category of the entire system.
(3) A qualified personnel who has a thorough understanding of the installed machine must switch the mode selector input. For example, a Switching Unit with Key must be used for the mode selector, and the key must be managed and used in such a way that the machine cannot be operated by unauthorized persons.

<G9SX-EX□>

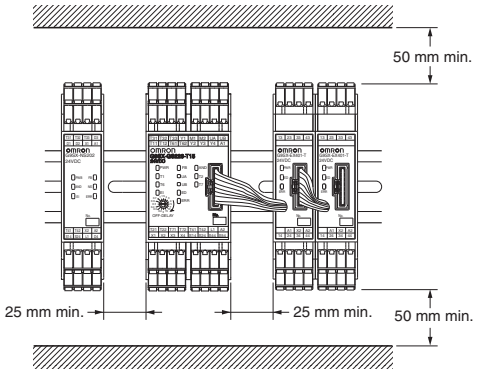
(1) The durability of relays depend greatly on the switching condition. Confirm the actual conditions of operation in which the relay will be used in order to make sure of the permissible number of switching operations.

■ Precautions for Correct Use

<Precautions for All G9SX Models>

(1) Handle with care
Do not drop G9SX to the ground or expose to excessive vibration or mechanical shocks. G9SX may be damaged and may not function properly.
(2) Conditions of storage
Do not store in such conditions stated below.
1. In direct sunlight
2. At ambient temperatures out of the range of −10 to 55°C.
3. At relative humidity out of the range of 25% to 85% or under such temperature change that causes condensation.
4. In corrosive or combustible gases
5. With vibration or mechanical shocks out of the rated values.
6. Under splashing of water, oil, chemicals
7. In the atmosphere containing dust, saline or metal powder.

G9SX may be damaged and may not function properly.
(3) Mounting
Mount G9SX to DIN track with attachments (PFP-M, not incorporated to this product), not to drop off the track by vibration or other force especially when the length of DIN track is short compared to the widths of G9SX.
(4) Following spacing around G9SX should be available to apply rated current to outputs of G9SX and for enough ventilation and wiring:
1. At least 25 mm beside side faces of the G9SX.
2. At least 50 mm above top face of G9SX and below bottom face of G9SX.



(5) Wiring
1. G9SX
• Wire the G9SX as described below.

Solid wire	0.2 to 2.5 mm² (AWG24 to AWG12)
Stranded wire	0.2 to 2.5 mm² (AWG24 to AWG12)

• Strip no more than 7 mm of insulation from the end of the wire.
• It is recommended that stranded wire be covered with insulated 0.25- to 2.5-mm² ferrules before connecting it.
2. G9SX-□-RT (with Screw Terminals)
• Tighten each screw to 0.5 to 0.6 N·m or the G9SX-□-RT may malfunction or generate heat.
3. Wiring for a Logical AND Connection
• Use a 2-conductor cabtire cable or shielded cable to wire a logical AND connection between Units.

(6) Connecting Expansion Units (G9SX-EX□-□):
(Only G9SX-AD□/-ADA□/-NSA□/-GS□)
1. Remove the termination connector from the G9SX, and insert the connector of the Expansion Unit into the G9SX to connect it.
2. Insert the termination connector into the last Expansion Unit as viewed from the G9SX. When the G9SX is used without any Expansion Units, do not remove the termination connector from the G9SX.
3. Do not remove the termination connector while the system is operating.
4. Before applying the power supply voltage, confirm that the connecting sockets and plugs are locked.
5. Make sure that all connected Expansion Units are supplied with power within 10 s after the power to the G9SX is turned ON. Otherwise, the G9SX will detect a power supply error for the Expansion Units.

(7) Use cables with length less than 100m to connect to Safety Inputs, Feed-back/Reset inputs, or between Logical AND connection inputs and Logical AND connection outputs, respectively.
(8) Set the time duration of OFF-delay to an appropriate value that does not cause the loss of safety function of system.
(9) Logical AND connection between Units:
1. When using Logical AND connection inputs, set the Logical AND connection preset switch to 'AND' position for the units which the logical AND connection signal are input to.
2. Connect Logical AND connection outputs appropriately to Logical AND connection inputs of the relevant unit. Verify the operation of G9SX before commissioning the system.
3. When configuring the safety related system, be sure to consider that the delay of response time caused by logical AND connections do not degrade the safety function of the system.
4. Use 2-conductor cabtire cable or shielded cable for logical AND connections between Units.

(10) To determine the safety distance to hazards, take into account the delay of safety outputs caused by the following times:
1. Response time of safety inputs
2. Response time of logical AND connection input (Also consider the precaution in "Note" below)
3. Preset OFF-delay time
4. Accuracy of OFF-delay time

Note: When connecting multiple Units with logical AND connections, the operating time and response time after logical AND connection inputs will be the sum of the operating times and response times of the Units that are connected in series by logical AND connections.

(11) Start entire system after more than 5s have passed since applying supply voltage to all G9SXs in the system.

(12) Power Supply
1. The G9SX may malfunction due to electromagnetic disturbances. Be sure to connect terminal A2 to ground.
2. When sharing a power supply with a Safety Light Curtain, use a power supply that will not fail for a momentary power interruption of 20 ms or less.

(13) Devices connected to G9SX may operate unexpectedly. When replacing G9SX, disconnect it from power supply.

(14) Adhesion of solvent such as alcohol, thinner, trichloroethane or gasoline on the product should be avoided. Such solvents make the marking on G9SX illegible and cause deterioration of parts.

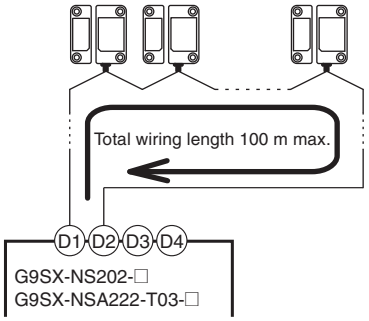
<G9SX-NS/-NSA, D40A>

For details, refer to D40A/G9SX-NS catalog (Cat. No. C160).

(1) Connection with Non-contact Door Switch
Wire conductors between the G9SX-NS□ and the D40A Non-contact Door Switch correctly and verify operation, before using the system.

(2) The D40A must be used with a designated actuator and G9SX-NS□ Controller.

(3) Use cables with a length of less than 100 m total to connect D40A Switches.



(4) Disconnect the G9SX-NS□ from the power supply when replacing the D40A. Devices connected to the G9SX-NS□ may operate unexpectedly.

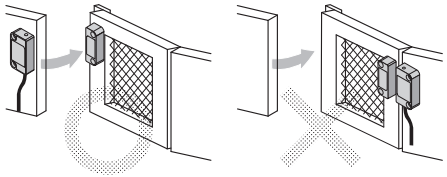
(5) Do not use the D40A in a magnetic field of 1.5 mT or higher. The D40A may not function properly.

(6) Do not use the D40A in the water or in an environment continuously exposed to water. Water may penetrate into the D40A. (The IP67 degree of protection for this switch means that it has been checked for penetration of water after having been left in water for a fixed period of time.)

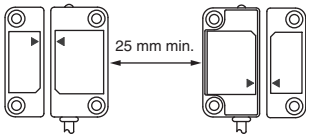
(7) Be sure to mount a guard stopper and guide to prevent the D40A Non-contact Door Switch from being subjected to impact.

(8) Do not use the switch or actuator as a stopper. Protect the switch and the actuator by installing a stopper. Separate the switch and the actuator to a distance of 1 mm or more.

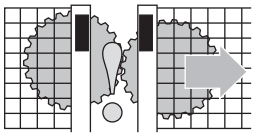
(9) Install the actuator and switch at an appropriate distance so that they do not create a gap that provides access to the hazard.



(10) Where two or more Switches are mounted side-by-side, they must be no closer than 25 mm.



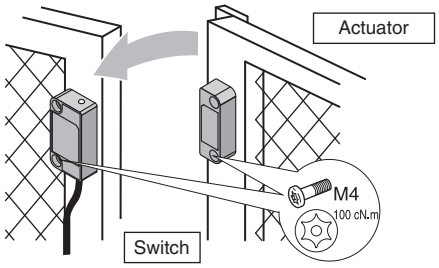
(11) Check that the machine is stopped whenever the interlocked guard door is open.



(12) Do not mount the switch and actuator on magnetic materials, otherwise it may affect the operating distance. Below are reference values of the effect to the operating distance.

Distance from surface of magnetic material	Operating distance
0 to 5 mm	Decrease to approx. 90% of rated value.
> 5 mm	No effect

(13) Tighten all screws to the specified torque by using non-magnetic M4 screws and washer for the installation of the switch and actuator. After installation and using, the actuator and switch fixing screws must be coated with tamper proof varnish or similar compound. Using anaerobic locking compounds can have a detrimental effect on the plastic switch case if the compounds come into contact with the switch case.



(14) Wiring
1. Use the following to wire to the product.
Stranded wire (flexible wire): 0.2 to 2.5 mm² (AWG24 to AWG12)
Solid wire (steel wire): 0.2 to 2.5 mm² (AWG24 to AWG12)
2. When an auxiliary output is not used, cut off the wiring and cover it with tape so that it does not contact other terminals.

<G9SX-GS>

(1) Use a mode selector that has an SPST-NO + SPST-NC contact form (e.g., OMRON's A22K-□-11).

■ Category of EN 954-1

In the condition shown in *Application Examples*, G9SX can be used for the corresponding categories up to category 4.
This does NOT mean that G9SX can always be used for required category under all the similar conditions and situations.
Conformity to the categories must be assessed as a whole system.
When using G9SX for safety categories, be sure to confirm the conformity as a whole system.

To conform with Safety Category 4 (EN954-1)

When using Non-contact Door Switch D40A/G9SX-NS□, the system can be used for the corresponding categories up to category 3.

1. Input the signals to both of the safety inputs (T11-T12, T21-T22, T61-T62 and T71-T72).
2. Input a signal to the safety inputs (T11-T12, T21-T22, T61-T62 and T71-T72) through switches with Direct Opening Mechanism.
   When using Limit Switches, at least one of them must have Direct Opening Mechanism.
3. When connecting Safety sensor with G9SX, use TYPE 4 safety sensor.
4. Input the signal through a NC contact of the contactor to Feedback/Reset input (T31-T32 for manual reset or T31-T33 for auto reset). (Refer to *Application Examples*)
5. Keep Cross fault detection mode input (Y1 and Y2) open. However, when connecting devices with self-diagnosis function, such as safety sensors, apply 24VDC to Y1 and Y2.
6. Be sure to Connect A2 to ground.
7. When using a G9SX-EX-□-□ Expansion Unit, connect fuses with a current rating of 3.15 A max. to the safety relay outputs to prevent the contacts from welding.

■ Compliance with International Standards

Item	Model	G9SX-AD G9SX-ADA	G9SX-NS G9SX-NSA	G9SX-BC	G9SX-GS	G9SX-EX
Approved by TÜV Product Service	EN50178	❍	❍	❍	❍	❍
	IEC/EN60204-1	❍	❍	❍	❍	❍
	EN954-1 Cat.4	❍		❍	❍	❍
	EN954-1 Cat.3		❍			
	IEC/EN61508 SIL3	❍	❍	❍	❍	❍
	IEC/EN62061 SIL3				❍	
	IEC/EN61000-6-2	❍		❍	❍	❍
	IEC/EN61000-6-4	❍		❍	❍	❍
	IEC/EN60947-5-2		❍			
	IEC/EN60947-5-3 PDF-M		❍			
Approved by UL	UL508	❍	❍	❍	❍	❍
	UL1998	❍	❍	❍	❍	❍
	NFPA79	❍	❍	❍	❍	❍
	IEC61508	❍	❍	❍	❍	❍
	CAN/CSA C22.2 No.142	❍	❍	❍	❍	❍
Approved by KOSHA		❍	❍	❍		❍

MEMO

READ AND UNDERSTAND THIS CATALOG

Please read and understand this catalog before purchasing the products. Please consult your OMRON representative if you have any questions or comments.

Warranty and Limitations of Liability

WARRANTY

OMRON's exclusive warranty is that the products are free from defects in materials and workmanship for a period of one year (or other period if specified) from date of sale by OMRON.

OMRON MAKES NO WARRANTY OR REPRESENTATION, EXPRESS OR IMPLIED, REGARDING NON-INFRINGEMENT, MERCHANTABILITY, OR FITNESS FOR PARTICULAR PURPOSE OF THE PRODUCTS. ANY BUYER OR USER ACKNOWLEDGES THAT THE BUYER OR USER ALONE HAS DETERMINED THAT THE PRODUCTS WILL SUITABLY MEET THE REQUIREMENTS OF THEIR INTENDED USE. OMRON DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED.

LIMITATIONS OF LIABILITY

OMRON SHALL NOT BE RESPONSIBLE FOR SPECIAL, INDIRECT, OR CONSEQUENTIAL DAMAGES, LOSS OF PROFITS OR COMMERCIAL LOSS IN ANY WAY CONNECTED WITH THE PRODUCTS, WHETHER SUCH CLAIM IS BASED ON CONTRACT, WARRANTY, NEGLIGENCE, OR STRICT LIABILITY.

In no event shall responsibility of OMRON for any act exceed the individual price of the product on which liability is asserted.

IN NO EVENT SHALL OMRON BE RESPONSIBLE FOR WARRANTY, REPAIR, OR OTHER CLAIMS REGARDING THE PRODUCTS UNLESS OMRON'S ANALYSIS CONFIRMS THAT THE PRODUCTS WERE PROPERLY HANDLED, STORED, INSTALLED, AND MAINTAINED AND NOT SUBJECT TO CONTAMINATION, ABUSE, MISUSE, OR INAPPROPRIATE MODIFICATION OR REPAIR.

Application Considerations

SUITABILITY FOR USE

OMRON shall not be responsible for conformity with any standards, codes, or regulations that apply to the combination of products in the customer's application or use of the product.

At the customer's request, OMRON will provide applicable third party certification documents identifying ratings and limitations of use that apply to the products. This information by itself is not sufficient for a complete determination of the suitability of the products in combination with the end product, machine, system, or other application or use.

The following are some examples of applications for which particular attention must be given. This is not intended to be an exhaustive list of all possible uses of the products, nor is it intended to imply that the uses listed may be suitable for the products:

- Outdoor use, uses involving potential chemical contamination or electrical interference, or conditions or uses not described in this document.
- Nuclear energy control systems, combustion systems, railroad systems, aviation systems, medical equipment, amusement machines, vehicles, safety equipment, and installations subject to separate industry or government regulations.
- Systems, machines, and equipment that could present a risk to life or property.

Please know and observe all prohibitions of use applicable to the products.

NEVER USE THE PRODUCTS FOR AN APPLICATION INVOLVING SERIOUS RISK TO LIFE OR PROPERTY WITHOUT ENSURING THAT THE SYSTEM AS A WHOLE HAS BEEN DESIGNED TO ADDRESS THE RISKS, AND THAT THE OMRON PRODUCT IS PROPERLY RATED AND INSTALLED FOR THE INTENDED USE WITHIN THE OVERALL EQUIPMENT OR SYSTEM.

Disclaimers

CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.

It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the product may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products.

DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

PROGRAMMABLE PRODUCTS

OMRON shall not be responsible for the user's programming of a programmable product, or any consequence thereof.

Copyright and Copy Permission

COPYRIGHT AND COPY PERMISSION

This document shall not be copied for sales or promotions without permission.

This document is protected by copyright and is intended solely for use in conjunction with the product. Please notify us before copying or reproducing this document in any manner, for any other purpose. If copying or transmitting this document to another, please copy or transmit it in its entirety.

OMRON Corporation
Industrial Automation Company

Safety Devices Division
Shiokoji Horikawa, Shimogyo-ku,
Kyoto, 600-8530 Japan
Tel: (81) 75-344-7093/Fax: (81) 75-344-8197

Regional Headquarters

OMRON EUROPE B.V.
Wegalaan 67-69, NL-2132 JD Hoofddorp
The Netherlands
Tel: (31)2356-81-300/Fax: (31)2356-81-388

OMRON SCIENTIFIC TECHNOLOGIES INC.
6550 Dumbarton Circle, Fremont
CA 94555-3605 U.S.A.
Tel: (1) 510-608-3400/Fax: (1) 510-744-1442

OMRON ASIA PACIFIC PTE. LTD.
No. 438A Alexandra Road # 05-05/08 (Lobby 2),
Alexandra Technopark, Singapore 119967
Tel: (65) 6835-3011/Fax: (65) 6835-2711

OMRON (CHINA) CO., LTD.
Room 2211, Bank of China Tower,
200 Yin Cheng Zhong Road,
Pu Dong New Area, Shanghai, 200120, China
Tel: (86) 21-5037-2222/Fax: (86) 21-5037-2200

Authorized Distributor:

Note: Specifications subject to change without notice.

Cat. No. Z255-E1-01
Printed in Japan
0807-0.3M (0307) (M)